# **Request for Proposal**

# Marshall County Schools H. W. Byers Attendance Center Strategic Energy Management (SEM) Uplift for Schools

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<sup>\*</sup> Not a biddable project

#### **Request for Proposal**

# Marshall County Schools H. W. Byers Attendance Center Strategic Energy Management (SEM) Uplift for Schools

#### 1. Overview

#### Introduction

This Request for Proposal is for Energy Upgrade initiatives at the Marshall County Schools H. W. Byers Attendance Center. The following Energy Conservation Measures (ECM's) are included. Those projects in red are not biddable, and will be performed by the school system.

- Lighting Upgrades
- Lighting Controls
- Window Film Installation
- Computer Plug Loads Management Software
- Vending Machine Controls
- Ice Machine and Refrigerated Cases
- HVAC Controls Labor Only
- Door Weatherstripping
- Water Heater Setpoint
- Refrigerator and Freezer Consolidation
- Laptop Charging Carts

These initiatives will be achieved with the assistance of TVA's School Uplift program.

"In keeping with TVA's mission of service, School Uplift is our way of supporting local schools. Through strategic energy management (SEM) training and investment, we're helping highneed schools reduce energy costs while making classrooms throughout the region brighter, safer, and happier places to learn and grow.

TVA EnergyRight's School Uplift supports schools in the region by reducing energy costs and improving the quality of the learning environment."

#### Location:

H. W. Byers Attendance Center 4178 Highway 72 East Holly Springs, MS 38635

RFP Submission Deadline	June 10, 2022
Vendor Scoring and Selection	June 20, 2022
Requested Work Completion	July 31, 2022

#### **RFP** contact:

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# **H. W. Byers Attendance Center**

The H. W. Byers Attendance Center, located in Holly Springs, MS, is a publicly funded school district that educates children in Marshall County. It was originally built in 1958, has various additions, and is comprised of several buildings totaling 89,185 square feet of conditioned space. The typical school design consists of classrooms, front offices, a cafeteria with attached kitchen, and two gymnasiums.

The school hosts approximately 600 students every year in grades K-12. The building operates 10 months out of the year, with two months of shutdown during the summer break. The typical hours of operation are from 6:45 am to 2:45 pm, and a modified schedule during fall, winter, and spring breaks and weekends.

# 2. Energy Conservation Measures (ECM's)

# 2.1 Lighting Upgrades

#### **Affected School Rooms**

**Entire School** 

## **Existing Conditions**

Fulton High School is currently illuminated by T8, T5HO, incandescent, CFL, HPS, metal halide, and LED lighting fixtures. The most prominent lighting technology used within the school is T8 lamps, followed by LED lamps.

## **Upgrade Recommendation**

The existing lighting is recommended to be upgraded using retrofitting kits to convert existing fixture housings to integral LED fixtures, with the remainder of the lighting fixtures to be replaced with new integral LED fixtures. In a few cases, for specific areas, LED bulb replacements are suggested instead of full fixture replacements. Suggested retrofit and replacement applications meet or exceed existing perceived light levels for the applicable area.

#### **Quality of Life Implications**

All of the replacements suggested will help to reduce the amount of energy used by the school. Replacing with LED technology will allow for significant kWh savings which in turn equates to a substantial reduction in energy and maintenance costs. To the occupants there will be a moderate visible change, including improved light levels and greater uniformity. The maintenance staff will notice there will be a lower frequency of lamp and ballast replacements.



# 2.1 Lighting Upgrades

		<b>Existing</b>		<b>Proposed</b>
<u>Location</u>	Existing Fixture	Qty.	Proposed Fixture	Qty.
			1L, 32W, LED (GE PVR-24-A-0-	
			4/4400-MM-8/4000-TT-RM-	
			WHTE), recessed 2x4 troffer with	
High School Bldg - Elevation -	2L, 32W, T8, recessed 2x4 troffer		electronic ballast and new dimmer	
Main Office	with electronic ballast	8	switch	8
			1L, 32W, LED (GE PVR-24-A-0-	
			4/4400-MM-8/4000-TT-RM-	
			WHTE), recessed 2x4 troffer with	
High School Bldg - Elevation -	2L, 32W, T8, recessed 2x4 troffer		electronic ballast and new dimmer	
Principle's Office	with electronic ballast	3	switch	3

High School Bldg - Elevation - Assist. Principle's Office	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	2	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	2
High School Bldg - Elevation - Corridor	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	38	1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast	38
High School Bldg - Elevation - Elec. Closet #1	1L, 8.5W, LED, surface mounted exposed with electronic ballast	2	Do nothing - Fixture to remain	2
High School Bldg - Elevation - Faculty RR	1L, 8.5W, LED, surface mounted exposed with electronic ballast	2	Install new wall-mounted occupancy sensor to reduce fixture burn hours.	2
High School Bldg - Elevation -	2L, 32W, T8, recessed 2x4 troffer		1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	
Women's RR #1	with electronic ballast	2	electronic ballast 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	2
High School Bldg - Elevation - Men's RR #1	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	2	WHTE), recessed 2x4 troffer with electronic ballast 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	2
High School Bldg - Elevation - Faculty Lounge	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	10	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	10
High School Bldg - Elevation - Room #56	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	10	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	10
High School Bldg - Elevation - Room #57	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	18	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-	18
High School Bldg - Elevation - Room #58	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	10	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	10
High School Bldg - Elevation - Room #58 Closet	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	2	4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	2
High School Bldg - Elevation - Room #59	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	10	4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	10
High School Bldg - Elevation - Room #61	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	10	4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	10
High School Bldg - Elevation - Room #63	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
High School Bldg - Elevation - Room #64	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8

			1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	
High School Bldg - Elevation - Room #65	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	8
High School Bldg - Elevation -	2L, 32W, T8, recessed 2x4 troffer	0	4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer	0
Room #66	with electronic ballast	8	switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with	8
High School Bldg - Elevation - Room #67	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	8
High School Bldg - Elevation - Room #68	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	12	electronic ballast and new dimmer switch	12
High School Bldg - Elevation - Elec. Closet #2	1L, 8.5W, LED, surface mounted exposed with electronic ballast	3	Do nothing - Fixture to remain	3
			1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	
High School Bldg - Elevation - Women's RR #2	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	2	WHTE), recessed 2x4 troffer with electronic ballast 1L, 50W, LED (GE RLB2-R4-0-70- V1-840-TT-RM-WHTE), surface	2
High School Bldg - Elevation - Men's RR #2	3L, 32W, T8, surface mounted 1x4 strip with electronic ballast	3	mounted 1x4 strip with electronic ballast 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	3
High School Bldg - Elevation - Room #71	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	9	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	9
High School Bldg - Elevation - Room #72	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	9	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	9
High School Bldg - Elevation - Room #72	1L, 60W, incandescent, lamp mounted exposed with ballast	7	1L, 9W, LED (GC #58037), lamp mounted exposed with electronic ballast	7
			1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	
High School Bldg - Elevation - Room #73	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	9	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	9
High School Bldg - Elevation - Room #74	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	9	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	9
High School Bldg - Elevation - Exterior	1L, 15W, LED, surface mounted canopy with electronic ballast	3	Do nothing - Fixture to remain 1L, 17.5W, LED (Lithonia	3
High School Bldg - Elevation - Exterior	1L, 26W, TTT, recessed downlight with electronic ballast	2	LDN4RV-40/15-LR4AR-LSS), recessed downlight with electronic ballast	2
High School Bldg - Elevation - Exterior	1L, 70W, HPS, surface mounted wall pack with magnetic ballast	2	1L, 25W, LED (GC #97973), surface mounted wall pack with electronic ballast	2
Two-Room Portable - Elevation - Room #1	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	14	1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	14

Two-Room Portable - Elevation - Room #2	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	15	1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	15
Two-Room Portable - Elevation -	1L, 7W, LED, surface mounted wall			
Exterior	pack with electronic ballast	2	Do nothing - Fixture to remain	2
Locker Portable - Elevation - Room #1	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	12	1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	12
Locker Portable - Elevation - Room #2	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	12	1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	12
Locker Portable - Elevation -	1L, 7W, LED, surface mounted wall			
Exterior	pack with electronic ballast	2	Do nothing - Fixture to remain	2
Concessions Bldg - Elevation - Concessions	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	2	1L, 50W, LED (GE RLB2-R4-0-70- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	2
Concessions Bldg - Elevation - Women's RR	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 49W, LED (Lithonia CLX-L48- 7000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x4 strip with electronic ballast and new dimmer switch	1
Concessions Bldg - Elevation - Women's RR	1L, 13W, CFL, surface mounted exposed with electronic ballast	1	1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip with electronic ballast	1
Concessions Bldg - Elevation - Men's RR	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 49W, LED (Lithonia CLX-L48-7000LM-SEF-RDL-MVOLT-EZ1-40K-80CRI-NLTAIR2 RES7PDT-WH), surface mounted 1x4 strip with electronic ballast and new dimmer switch	1
Concessions Bldg - Elevation - Men's RR	1L, 8.5W, LED, surface mounted exposed with electronic ballast	1	1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip with electronic ballast	1
Concessions Bldg - Elevation - Exterior	2L, 60W, BR incandescent, surface mounted flood with ballast 1L, 400W, metal halide, pole	2	2L, 9.5W, LED (TCP #LED10A19DOD41KW), surface mounted exposed with electronic ballast	2
Sports Field - Elevation - Exterior	mounted flood with magnetic ballast	58	Do nothing - Fixture to remain	58
Large Gym Bldg - Elevation - Corridor Large Gym Bldg - Elevation -	2L, 32W, T8, recessed 2x4 troffer with electronic ballast 1L, 8.5W, LED, surface mounted	15	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast Install new wall-mounted occupancy sensor to reduce fixture	15
Janitor's Closet  Large Gym Bldg - Elevation - Women's RR #1	exposed with electronic ballast  1L, 100W, incandescent, surface mounted exposed with ballast	1	burn hours.  1L, 11W, LED (Lithonia CLX-L24-1500LM-SEF-RDL-MVOLT-EZ1-40K-80CRI-NLTAIR2 RES7PDT-WH), surface mounted 1x2 strip with electronic ballast	1
				•

Large Gym Bldg - Elevation - Women's RR #1	2L, 13W, TTT, surface mounted canopy with electronic ballast	1	1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip with electronic ballast	1
Large Gym Bldg - Elevation - Men's RR #1	1L, 13W, CFL, surface mounted exposed with electronic ballast	1	1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip with electronic ballast 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	1
Large Gym Bldg - Elevation - Library	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	32	electronic ballast and new dimmer switch	32
Large Gym Bldg - Elevation - Library Closets  Large Gym Bldg - Elevation -	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast  2L, 32W, T8, recessed 2x4 troffer	2	1L, 34W, LED (GE RLB2-R4-0-50-V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer	2
Room #50	with electronic ballast	6	switch  1L, 34W, LED (GE RLB2-R4-0-50-	6
Large Gym Bldg - Elevation - Room #52	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	6	V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	6
Large Gym Bldg - Elevation - Room #52	1L, 60W, incandescent, surface mounted exposed with ballast	1	1L, 9W, LED (GC #58039), surface mounted exposed with electronic ballast	1
Large Gym Bldg - Elevation - Room #52 Office  Large Gym Bldg - Elevation -	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast 1L, 8.5W, LED, surface mounted	1	1L, 34W, LED (GE RLB2-R4-0-50-V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch Install new wall-mounted occupancy sensor to reduce fixture	1
Room #52 RR	exposed with electronic ballast	1	burn hours.  1L, 9W, LED (GC #58039), surface	1
Large Gym Bldg - Elevation - Room #52 Closet	1L, 13W, CFL, surface mounted exposed with electronic ballast	1	mounted exposed with electronic ballast	1
Large Gym Bldg - Elevation - Computer Lab	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	2	1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	2
Large Gym Bldg - Elevation - Shop Class	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	6	1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch	6
Large Gym Bldg - Elevation - Shop Closet	1L, 13W, CFL, surface mounted exposed with electronic ballast	1	1L, 9W, LED (GC #58039), surface mounted exposed with electronic ballast	1
Large Gym Bldg - Elevation - Shop Office	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 34W, LED (GE RLB2-R4-0-50-V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch 1L, 68W, LED (GE ABV3-0-12-T-48-1D-DF-ST-K-Q-W), pendent mounted 2x4 low bay with	1
Large Gym Bldg - Elevation - Shop	4L, 32W, T8, pendent mounted 2x4 low bay with electronic ballast	15	electronic ballast and new dimmer switch	15
Large Gym Bldg - Elevation - Shop	1L, 8.5W, LED, surface mounted exposed with electronic ballast	1	Install new dimmer switch to reduce fixture burn hours.	1

Large Gym Bldg - Elevation - Gym	4L, 32W, T8, surface mounted 1x8 strip with electronic ballast	10	1L, 63W, LED (GE RLB2-D8-0-10-V1-840-TT-RM-WHTE), surface mounted 1x8 strip with electronic ballast and new dimmer switch 1L, 109W, LED (GE ABV3-0-18-T-48-1D-DF-ST-K-Q-W), pendent mounted 2x4 high bay with	10
Large Gym Bldg - Elevation - Gym	6L, 32W, T8, pendent mounted 2x4 high bay with electronic ballast	24	electronic ballast and new dimmer switch	24
Large Gym Bldg - Elevation - Gym Rooms	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	7	1L, 35W, LED (Lithonia CLX-L48- 5000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x4 strip with electronic ballast and new dimmer switch	7
Large Gym Bldg - Elevation - Gym Rooms	1L, 8.5W, LED, surface mounted exposed with electronic ballast	11	1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip with electronic ballast	11
Large Gym Bldg - Elevation - Gym Rooms	1L, 13W, CFL, surface mounted exposed with electronic ballast	6	1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip with electronic ballast	6
Large Gym Bldg - Elevation - Gym Rooms	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 49W, LED (Lithonia CLX-L48- 7000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x4 strip with electronic ballast	1
Large Gym Bldg - Elevation - Gym Rooms	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	4	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast	4
Large Gym Bldg - Elevation - Gym Corridor	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 35W, LED (Lithonia CLX-L48- 5000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x4 strip with electronic ballast	1
Large Gym Bldg - Elevation - Gym Corridor	2L, 13W, TTT, surface mounted canopy with electronic ballast	2	1L, 35W, LED (Lithonia CLX-L48-5000LM-SEF-RDL-MVOLT-EZ1-40K-80CRI-NLTAIR2 RES7PDT-WH), surface mounted 1x4 strip with electronic ballast	2
Large Gym Bldg - Elevation - Gym Corridor	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	4	1L, 35W, LED (Lithonia CLX-L48-5000LM-SEF-RDL-MVOLT-EZ1-40K-80CRI-NLTAIR2 RES7PDT-WH), surface mounted 1x4 strip with electronic ballast	4
Large Gym Bldg - Elevation - Gym	4L, 32W, T8, surface mounted 1x4	4	1L, 49W, LED (Lithonia CLX-L48-7000LM-SEF-RDL-MVOLT-EZ1-40K-80CRI-NLTAIR2 RES7PDT-WH), surface mounted 1x4 strip	4
Locker Room #1  Large Gym Bldg - Elevation - Gym	strip with electronic ballast  1L, 8.5W, LED, surface mounted	3	with electronic ballast	3
Locker Room #1	exposed with electronic ballast	1	Do nothing - Fixture to remain  1L, 49W, LED (Lithonia CLX-L48-	1
Large Gym Bldg - Elevation - Gym Locker Room #2	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	3	7000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x4 strip with electronic ballast	3
Large Gym Bldg - Elevation - Gym Locker Room #2	1L, 8.5W, LED, surface mounted exposed with electronic ballast	1	Do nothing - Fixture to remain	1

			1L, 49W, LED (Lithonia CLX-L48-	
Large Gym Bldg - Elevation - Gym Locker RR	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	3	7000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x4 strip with electronic ballast	3
Large Gym Bldg - Elevation - Gym Locker RR	1L, 8.5W, LED, surface mounted exposed with electronic ballast	1	Do nothing - Fixture to remain	1
Large Gym Bldg - Elevation - Gym Laundry Room	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	2	1L, 35W, LED (Lithonia CLX-L48-5000LM-SEF-RDL-MVOLT-EZ1-40K-80CRI-NLTAIR2 RES7PDT-WH), surface mounted 1x4 strip with electronic ballast and new dimmer switch	2
Large Gym Bldg - Elevation - Gym	1L, 8.5W, LED, surface mounted	2	1L, 35W, LED (Lithonia CLX-L48- 5000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x4 strip with electronic ballast	2
Laundry Room	exposed with electronic ballast	2	1L, 35W, LED (Lithonia CLX-L48- 5000LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT-	2
Large Gym Bldg - Elevation - Gym Laundry Room	2L, 17W, T8, surface mounted 1x2 strip with electronic ballast	1	WH), surface mounted 1x4 strip with electronic ballast 1L, 34W, LED (GE RLB2-R4-0-50-	1
Large Gym Bldg - Elevation - Concessions	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	2	V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch 1L, 34W, LED (GE RLB2-R4-0-50-	2
Large Gym Bldg - Elevation - Conc. Women's RR	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	4	V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast 1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface	4
Large Gym Bldg - Elevation - Conc. Men's RR	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	3	mounted 1x4 strip with electronic ballast	3
	OL COM DD:		2L, 9.5W, LED (TCP #LED10A19DOD41KW), surface	
Large Gym Bldg - Elevation - Exterior	2L, 60W, BR incandescent, surface mounted flood with ballast	5	mounted exposed with electronic ballast	5
Large Gym Bldg - Elevation - Exterior	1L, 15W, LED, surface mounted canopy with electronic ballast	2	Do nothing - Fixture to remain	2
Large Gym Bldg - Elevation - Exterior	1L, 7W, LED, surface mounted wall pack with electronic ballast	4	Do nothing - Fixture to remain	4
Large Gym Bldg - Elevation - Exterior	1L, 70W, HPS, surface mounted wall pack with magnetic ballast	1	1L, 25W, LED (GC #97973), surface mounted wall pack with electronic ballast 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	1
Elem./Middle School Bldg - Elevation - Cafeteria	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	14	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	14
Elem./Middle School Bldg - Elevation - Kitchen	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	11	electronic ballast and new dimmer switch	11
Elem./Middle School Bldg - Elevation - Kitchen	1L, 8.5W, LED, surface mounted exposed with electronic ballast	6	Do nothing - Fixture to remain	6
Elem./Middle School Bldg -	1L, 8.5W, LED, surface mounted		1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip with electronic ballast and new	
Elevation - Kitchen	exposed with electronic ballast	2	dimmer switch	2

Elem./Middle School Bldg - Elevation - Kitchen RR	1L, 8.5W, LED, surface mounted exposed with electronic ballast	1	Install new wall-mounted occupancy sensor to reduce fixture burn hours.	1
Elem./Middle School Bldg - Elevation - Corridor	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	50	1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast	59
Elem./Middle School Bldg - Elevation - Corridor	1L, 8.5W, LED, surface mounted exposed with electronic ballast	59 3	Install new wireless ceiling occupancy sensor to reduce fixture burn hours.	3
Elem./Middle School Bldg - Elevation - Corridor	1L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 14W, TLED (GC #35655), surface mounted 1x4 strip with electronic ballast	1
Elem./Middle School Bldg - Elevation - Women's RR #1	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	3	1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast	3
Elem./Middle School Bldg - Elevation - Men's RR #1	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	4	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-	4
Elem./Middle School Bldg - Elevation - Room #15	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #16	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #17	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8
Elem./Middle School Bldg - Elevation - Women's RR #2	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	2	1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast	2
Elem./Middle School Bldg - Elevation - Men's RR #2 Elem./Middle School Bldg -	2L, 32W, T8, recessed 2x4 troffer with electronic ballast 1L, 8.5W, LED, surface mounted	2	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast	2
Elevation - Elec. Closet #1	exposed with electronic ballast	1	Do nothing - Fixture to remain Install new wall-mounted	1
Elem./Middle School Bldg - Elevation - Storage Closet	1L, 8.5W, LED, surface mounted exposed with electronic ballast	1	occupancy sensor to reduce fixture burn hours. 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	1
Elem./Middle School Bldg - Elevation - Room #18	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #19	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	8
Elem./Middle School Bldg - Elevation - Room #20	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	electronic ballast and new dimmer switch	8

Elem./Middle School Bldg - Elevation - Women's RR #3	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	3	1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast	3
			1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	
Elem./Middle School Bldg - Elevation - Men's RR #3	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	3	WHTE), recessed 2x4 troffer with electronic ballast 1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface	3
Elem./Middle School Bldg - Elevation - Elec. Closet #2	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	2	mounted 1x4 strip with electronic ballast 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-	2
Elem./Middle School Bldg - Elevation - Room #25	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8
Elem./Middle School Bldg -	2L, 32W, T8, recessed 2x4 troffer		1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer	
Elevation - Room #26	with electronic ballast	8	switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with	8
Elem./Middle School Bldg - Elevation - Room #27	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #28	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	8
Elem./Middle School Bldg - Elevation - Room #31	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	8
Elem./Middle School Bldg - Elevation - Room #32	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	8
Elem./Middle School Bldg - Elevation - Room #33	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	8
Elem./Middle School Bldg - Elevation - Room #34	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8
Elem./Middle School Bldg - Elevation - Room #35	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8
Elem./Middle School Bldg -	2L, 32W, T8, recessed 2x4 troffer		1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer	
Elevation - Room #36	with electronic ballast	8	switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with	8
Elem./Middle School Bldg - Elevation - Nurse Office	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	3	electronic ballast and new dimmer switch	3

Elem./Middle School Bldg - Elevation - Elem. Principle's Office	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	4	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-	4
Elem./Middle School Bldg - Elevation - Teacher's Lounge	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	4	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	4
Elem./Middle School Bldg - Elevation - Teacher's Lounge RR	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	1	1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast	1
Elem./Middle School Bldg -	2L, 60W, incandescent, surface		1L, 11W, LED (Lithonia CLX-L24- 1500LM-SEF-RDL-MVOLT-EZ1- 40K-80CRI-NLTAIR2 RES7PDT- WH), surface mounted 1x2 strip	
Elevation - Teacher's Lounge RR	mounted exposed with ballast	1	with electronic ballast 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	1
Elem./Middle School Bldg - Elevation - Room #13	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #11	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #10	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #7 Elem./Middle School Bldg -	2L, 32W, T8, recessed 2x4 troffer with electronic ballast 1L, 8.5W, LED, lamp mounted	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8
Elevation - Room #7	exposed with electronic ballast	1	Do nothing - Fixture to remain	1
Elem./Middle School Bldg - Elevation - Maint. Room	1L, 8.5W, LED, surface mounted exposed with electronic ballast	2	Do nothing - Fixture to remain 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	2
Elem./Middle School Bldg - Elevation - Room #4	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	10	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	10
Elem./Middle School Bldg - Elevation - Special Ed. Room	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	3	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	3
Elem./Middle School Bldg - Elevation - Room #37	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	electronic ballast and new dimmer switch	8
Elem./Middle School Bldg - Elevation - I.T. Closet	4L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 50W, LED (GE RLB2-R4-0-70- V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch 1L, 50W, LED (GE RLB2-R4-0-70- V1-840-TT-RM-WHTE), surface	1
Elem./Middle School Bldg - Elevation - I.T. Closet	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	mounted 1x4 strip with electronic ballast	1

			1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	
Elem./Middle School Bldg - Elevation - Room #38	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	4	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	4
Elem./Middle School Bldg - Elevation - Room #39	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	8
Elem./Middle School Bldg - Elevation - Room #40	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8
Elem./Middle School Bldg -	2L, 32W, T8, recessed 2x4 troffer		1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer	
Elevation - Room #41	with electronic ballast	10	switch	10
Elem./Middle School Bldg - Elevation - Room #41	1L, 13W, CFL, lamp mounted exposed with electronic ballast	1	1L, 9W, LED (GC #58039), lamp mounted exposed with electronic ballast 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	1
Elem./Middle School Bldg - Elevation - Room #42	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Room #43	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	10	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	10
Elem./Middle School Bldg - Elevation - Room #43	1L, 60W, incandescent, lamp mounted exposed with ballast	1	1L, 9W, LED (GC #58037), lamp mounted exposed with electronic ballast 1L, 32W, LED (GE PVR-24-A-0-	1
Elem./Middle School Bldg - Elevation - Room #44	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	8	4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	8
Elem./Middle School Bldg -	2L, 32W, T8, recessed 2x4 troffer		1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with electronic ballast and new dimmer	
Elevation - Room #45	with electronic ballast	8	switch 1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM-	8
Elem./Middle School Bldg - Elevation - Counselor's Office	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	4	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	4
Elem./Middle School Bldg - Elevation - Counselor's Office	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	1L, 34W, LED (GE RLB2-R4-0-50-V1-840-TT-RM-WHTE), surface mounted 1x4 strip with electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-	1
Elem./Middle School Bldg - Elevation - Main Office	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	2	WHTE), recessed 2x4 troffer with electronic ballast and new dimmer switch	2
Elem./Middle School Bldg - Elevation - Main Office	1L, 8.5W, LED, surface mounted exposed with electronic ballast	3	Do nothing - Fixture to remain 1L, 15W, LED (GC #98146),	3
Elem./Middle School Bldg - Elevation - Main Office	1L, 23W, BR CFL, surface mounted exposed with electronic ballast	1	surface mounted exposed with electronic ballast	1

			1L, 32W, LED (GE PVR-24-A-0- 4/4400-MM-8/4000-TT-RM- WHTE), recessed 2x4 troffer with	
Elem./Middle School Bldg - Elevation - Room A	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	2	electronic ballast and new dimmer switch	2
Elem./Middle School Bldg - Elevation - Exterior	1L, 28W, LED, surface mounted wall pack with electronic ballast	3	Do nothing - Fixture to remain	3
Elem./Middle School Bldg - Elevation - Exterior  Elem./Middle School Bldg -	<ul><li>1L, 7W, LED, surface mounted wall pack with electronic ballast</li><li>1L, 70W, HPS, surface mounted</li></ul>	2	Do nothing - Fixture to remain 1L, 25W, LED (GC #97973), surface mounted wall pack with	2
Elevation - Exterior	wall pack with magnetic ballast	7	electronic ballast 1L, 34W, LED (GE RLB2-R4-0-50- V1-840-TT-RM-WHTE), surface	7
Small Gym Bldg - Elevation - Gym/Stage	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	38	mounted 1x4 strip with electronic ballast and new dimmer switch 1L, 109W, LED (GE ABV3-0-18-T- 48-1D-DF-ST-K-Q-W), pendent mounted 2x4 high bay with	38
Small Gym Bldg - Elevation - Gym	5L, 54W, T5HO, pendent mounted 2x4 high bay with electronic ballast	12	electronic ballast and new dimmer switch 1L, 32W, LED (GE PVR-24-A-0-	12
Small Gym Bldg - Elevation - Corridor	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	4	4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast	4
Small Gym Bldg - Elevation - Men's RR	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	3	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast	3
Small Gym Bldg - Elevation - Women's RR	2L, 32W, T8, recessed 2x4 troffer with electronic ballast	3	1L, 32W, LED (GE PVR-24-A-0-4/4400-MM-8/4000-TT-RM-WHTE), recessed 2x4 troffer with electronic ballast	3
Small Gym Bldg - Elevation - Women's RR	2L, 32W, T8, surface mounted 1x4 vaportite with electronic ballast	1	1L, 35W, LED (Lithonia CLX-L48-5000LM-SEF-RDL-MVOLT-EZ1-40K-80CRI-NLTAIR2 RES7PDT-WH), surface mounted 1x4 strip with electronic ballast 1L, 34W, LED (GE RLB2-R4-0-50-V1-840-TT-RM-WHTE), surface	1
Small Gym Bldg - Elevation - Closet	2L, 32W, T8, surface mounted 1x4 strip with electronic ballast	1	mounted 1x4 strip with electronic ballast	1
Small Gym Bldg - Elevation - Exterior	1L, 15W, LED, surface mounted canopy with electronic ballast	2	Do nothing - Fixture to remain 1L, 25W, LED (GC #97973),	2
Small Gym Bldg - Elevation - Exterior	1L, 70W, HPS, surface mounted wall pack with magnetic ballast	4	surface mounted wall pack with electronic ballast	4
Site - Elevation - Exterior	1L, 150W, HPS, pole mounted area light with magnetic ballast	13	1L, 122W, LED (GE EACL-01-0- F4-AF-7-40-X-E-C1-GRAY), pole mounted area light with electronic ballast	13
Site - Elevation - Exterior	1L, 400W, HPS, pole mounted area light with magnetic ballast	7	1L, 122W, LED (GE EACL-01-0- F4-AF-7-40-X-E-C1-GRAY), pole mounted area light with electronic ballast	7
All Bldgs - Elevation - Interior	1L, 2W, CFL, surface mounted egress with electronic ballast	15	1L, 2W, LED battery, surface mounted egress with electronic ballast	131
All Bldgs - Elevation - Interior	1L, 8W, CFL, surface mounted exit with electronic ballast	20	1L, 2.5W, LED (Lightalarms QLXN500-RN), surface mounted exit with electronic ballast	35
All Bldgs - Elevation - Exterior	1L, 2W, CFL, surface mounted egress with electronic ballast	2	1L, 2W, LED (Mule EAE-BB-10- DB-W), surface mounted egress with electronic ballast	35

## **2.2 Lighting Controls**

#### **Affected School Rooms**

Entire School

#### **Existing Conditions**

Currently there are no use of lighting controls, either externally to or integral to any lighting fixture found within H W Byers.

#### **Upgrade Recommendation**

Following energy code, as defined in ASHRAE 2013, it is recommended to install occupancy sensors, lighting fixture dimmers, and daylight sensors across all areas of the school in various combinations depending on area. The overall implementation is to reduce burn hours of fixtures and kWh used. A majority of the associated sensors needed to outfit the school are integral to the selections made to replace the current lighting fixtures.

#### **Quality of Life Implications**

This is purely an energy saving measure which will allow for significant kWh savings which in turn equates to a substantial reduction in maintenance costs. The maintenance staff will notice there will be a lower frequency of lamp and ballast replacements.



Refer to the control specifications contained in section 2.1 Lighting Upgrades

#### 2.3 Install Window Film

#### **Affected School Rooms**

ΑII

#### **Existing Conditions**

The current windows are in good condition but still allow for significant solar heat gain to the spaces.

#### **Upgrade Recommendation**

Window films are available to reduce solar gain as well as add insulation to reduce heat gain and loss via conduction. One example of this product is 3M All Season Window Film. Due to the solar heat gain being beneficial during the heating season there is an increased energy use required due to the loss of solar heat gain. The increased insulation properties of this product help to offset that. Unfortunately, due to the high cost of the propane utilized for heating at this location, this change would cause an increase in yearly utility costs.

# **Quality of Life Implications**

This change would also reduce glare for the occupants which can provide for improved student outcomes.

# **Specifications**



# 2.3 Install Window Film

Cooling - Conduction					
Existing Cooling Conductio	n:				
Fulton @ Outside Temp: 107	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   107 °F - 73 °F   x 0.00% Bin hours @ Temp	=	0 Btu/hr
Fulton @ Outside Temp: 107	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   107 °F - 90 °F   x 0.00% Bin hours @ Temp	=	0 Btu/hr
Fulton @ Outside Temp: 102	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   102 °F - 73 °F   x 0.08% Bin hours @ Temp	=	46 Btu/hr
Fulton @ Outside Temp: 102	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   102 °F - 90 °F   x 0.01% Bin hours @ Temp	=	3 Btu/hr
Fulton @ Outside Temp: 97	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   97 °F - 73 °F   x 0.74% Bin hours @ Temp	=	352 Btu/hr
Fulton @ Outside Temp: 97	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   97 °F - 90 °F   x 0.17% Bin hours @ Temp	=	24 Btu/hr
Fulton @ Outside Temp: 92	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   92 °F - 73 °F   x 2.34% Bin hours @ Temp	=	878 Btu/hr
Fulton @ Outside Temp: 92	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   92 °F - 90 °F   x 0.69% Bin hours @ Temp	=	27 Btu/hr
Fulton @ Outside Temp: 87	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   87 °F - 73 °F   x 3.51% Bin hours @ Temp	=	969 Btu/hr
Fulton @ Outside Temp: 87	131 glass windows x			=	106 Btu/hr
Fulton @ Outside Temp: 82	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   82 °F - 73 °F   x 3.67% Bin hours @ Temp	=	651 Btu/hr
Fulton @ Outside Temp: 82	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   82 °F - 90 °F   x 3.94% Bin hours @ Temp	=	622 Btu/hr
Fulton @ Outside Temp: 77	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   77 °F - 73 °F   x 3.28% Bin hours @ Temp	=	259 Btu/hr
Fulton @ Outside Temp: 77	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   77 °F - 90 °F   x 7.31% Bin hours @ Temp	=	1,873 Btu/hr
Fulton @ Outside Temp: 72	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   72 °F - 73 °F   x 2.94% Bin hours @ Temp	=	58 Btu/hr
Fulton @ Outside Temp: 72	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   72 °F - 90 °F   x 8.14% Bin hours @ Temp	=	2,889 Btu/hr
Fulton @ Outside Temp: 67	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   67 °F - 73 °F   x 2.72% Bin hours @ Temp	=	322 Btu/hr
Fulton @ Outside Temp: 67	131 glass windows x	14.07 ft <sup>2</sup>	1.07 U-value x   67 °F - 90 °F   x 6.75% Bin hours @ Temp	=	3,059 Btu/hr
Total Existing Cooling Conduction	on:			= 1	12,136 Btu/hr
Recommended Cooling Co	nduction:				
Fulton @ Outside Temp: 107	131 glass windows x			=	0 Btu/hr
Fulton @ Outside Temp: 107	131 glass windows x			=	0 Btu/hr
Fulton @ Outside Temp: 102	131 glass windows x	14.07 ft <sup>2</sup>	0.77 U-value x   102 °F - 73 °F   x 0.08% Bin hours @ Temp	=	33 Btu/hr
Fulton @ Outside Temp: 102	131 glass windows x	14.07 ft <sup>2</sup>	0.77 U-value x   102 °F - 90 °F   x 0.01% Bin hours @ Temp	=	2 Btu/hr
Fulton @ Outside Temp: 97	131 glass windows x			=	253 Btu/hr
Fulton @ Outside Temp: 97	131 glass windows x			=	17 Btu/hr
Fulton @ Outside Temp: 92	131 glass windows x			=	632 Btu/hr
Fulton @ Outside Temp: 92	131 glass windows x	14.07 ft <sup>2</sup>	0.77 U-value x   92 °F - 90 °F   x 0.69% Bin hours @ Temp	=	19 Btu/hr
Fulton @ Outside Temp: 87	131 glass windows x			=	697 Btu/hr
Fulton @ Outside Temp: 87	131 glass windows x		0.77 U-value x   87 °F - 90 °F   x 1.78% Bin hours @ Temp	=	76 Btu/hr
Fulton @ Outside Temp: 82	131 glass windows x	_	0.77 U-value x   82 °F - 73 °F   x 3.67% Bin hours @ Temp	=	469 Btu/hr
Fulton @ Outside Temp: 82	131 glass windows x			=	448 Btu/hr
Fulton @ Outside Temp: 77	131 glass windows x			=	186 Btu/hr
Fulton @ Outside Temp: 77	131 glass windows x		0.77 U-value x   77 °F - 90 °F   x 7.31% Bin hours @ Temp	=	1,348 Btu/hr
Fulton @ Outside Temp: 72	131 glass windows x			=	42 Btu/hr
Fulton @ Outside Temp: 72	131 glass windows x			=	2,079 Btu/hr
Fulton @ Outside Temp: 67	131 glass windows x			=	232 Btu/hr
Fulton @ Outside Temp: 67	131 glass windows x	14.07 ft <sup>2</sup>	0.77 U-value x   67 °F - 90 °F   x 6.75% Bin hours @ Temp		2,201 Btu/hr
Total Existing Cooling Conduction					8,734 Btu/hr
Total Cooling Conduction Savin	ngs:			=	3,403 Btu/hr



# 2.3 Install Window Film Continued

LP I	Solar:	0.145 :	T ,		0.0.642	0.57.0bdi		FOE A C-I LIC		E 207 5: *
High	Ε	3 Window		X	_			505 Avg. Solar HG Factor		5,397 Btu/h
ELEWMIDDLE	N	5 Window		X				169 Avg. Solar HG Factor		6,408 Btu/h
GYMVOTECH	N	4 Window		Х		•		169 Avg. Solar HG Factor		7,348 Btu/h
High	E	4 Window		Х	_	0.57 Shading Coefficient		505 Avg. Solar HG Factor		15,304 Btu/h
High	W	4 Window		X		0.57 Shading coefficient		505 Avg. Solar HG Factor		15,304 Btu/h
GYMVOTECH	E	3 Window	Type 4	X		0.57 Shading Coefficient		505 Avg. Solar HG Factor		11,478 Btu/h
ELEWMIDDLE	S	10 Window	Type 5	X		0.57 Shading Coefficient		393 Avg. Solar HG Factor		30,811 Btu/h
ELEWMIDDLE	SSW	16 Window	Type 5	X		0.57 Shading Coefficient		481 Avg. Solar HG Factor		60,357 Btu/h
ELEMMIDDLE	W	13 Window	Type 5	X	13.8 ft <sup>10</sup> x	0.57 Shading coefficient	X	505 Avg. Solar HG Factor	=	51,453 Btu/h
ELEWMIDDLE	E	8 Window	Type 5	X	13.8 ft <sup>11</sup> x	0.57 Shading Coefficient	X	505 Avg. Solar HG Factor	=	31,664 Btu/h
ELEWMIDDLE	N	4 Window	Type 5	Х	13.8 ft <sup>12</sup> x	0.57 Shading Coefficient	Х	169 Avg. Solar HG Factor	=	5,286 Btu/h
ELEWMIDDLE	NE	16 Window	Type 5	х	13.8 ft <sup>13</sup> x	0.57 Shading Coefficient	х	317 Avg. Solar HG Factor	=	39,767 Btu/h
GYMVOTECH	S	4 Window	Type 6	х	12.7 ft14 x	0.57 Shading coefficient	х	393 Avg. Solar HG Factor	=	11,353 Btu/h
GYMVOTECH	S	9 Window	Type 7	х	12.8 ft <sup>15</sup> x	0.57 Shading coefficient	х	393 Avg. Solar HG Factor	=	25,769 Btu/h
High	S	14 Window		x		0.57 Shading Coefficient		393 Avg. Solar HG Factor		52,286 Btu/h
High	E	2 Window	21	x		0.57 Shading Coefficient		505 Avg. Solar HG Factor		9,595 Btu/h
ELEWMIDDLE	SSW	4 Window	21	x		0.57 Shading Coefficient		481 Avg. Solar HG Factor		9,282 Btu/h
ELEWMIDDLE	W	2 Window		x		0.57 Shading Coefficient		505 Avg. Solar HG Factor		4,869 Btu/h
FI FWMIDDLE	N	2 Window		X		0.57 Shading Coefficient		169 Avg. Solar HG Factor		1,626 Btu/h
High	w	4 Window				0.57 Shading Coefficient		505 Avg. Solar HG Factor		32,623 Btu/h
Total Existing Cooling		4 WINDOW	Type 10	Α.	20.5 10 %	U.ST Cridding Coefficient		303 7179. Coldi 110 Factor	_	427,981 Btu/h
	•									
Recommended C	ooling Solar:					₹				
High	E	3 Window	Type 1	х	6.3 ft <sup>2</sup> x	0.24 Shading Coefficient	Х	505 Avg. Solar HG Factor	=	2,273 Btu/h
ELEWMIDDLE	N	5 Window	Type 2	х		0.24 Shading coefficient		169 Avg. Solar HG Factor	_	2,698 Btu/h
GYMVOTECH	N.					U.24 Strauling Coefficient	х		=	
	N	4 Window	Type 3	x				169 Avg. Solar HG Factor		3,094 Btu/h
Hiah		4 Window 4 Window		X X	19.1 ft <sup>4</sup> x	0.24 Shading Coefficient	X	169 Avg. Solar HG Factor 505 Avg. Solar HG Factor	=	
9	E W	4 Window	Type 4		19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x	0.24 Shading Coefficient 0.24 Shading Coefficient	X X	505 Avg. Solar HG Factor	= =	3,094 Btu/r 6,444 Btu/r
High	E W	4 Window 4 Window	Type 4 Type 4	x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x	0.24 Shading Coefficient 0.24 Shading Coefficient 0.24 Shading Coefficient	x x x	505 Avg. Solar HG <sub>Factor</sub> 505 Avg. Solar HG <sub>Factor</sub>	= = =	3,094 Btu/h 6,444 Btu/h 6,444 Btu/h
High GYMVOTECH	E W E	4 Window 4 Window 3 Window	Type 4 Type 4 Type 4	x x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x	0.24 Shading coemcient 0.24 Shading coemcient 0.24 Shading coemcient 0.24 Shading coemcient	x x x	505 Avg. Solar HG <sub>Factor</sub> 505 Avg. Solar HG <sub>Factor</sub> 505 Avg. Solar HG <sub>Factor</sub>	= = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r
High GYMVOTECH ELEWMIDDLE	E W E S	4 Window 4 Window 3 Window 10 Window	Type 4 Type 4 Type 4 Type 5	X X X	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x	0.24 Shading coemclent	x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor	= = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r
High GYMVOTECH ELEWMIDDLE ELEWMIDDLE	E W E S	4 Window 4 Window 3 Window 10 Window 16 Window	Type 4 Type 4 Type 4 Type 5 Type 5	x x x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>9</sup> x	0.24 Shading coemcient	x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor	= = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r
High GYMVOTECH ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE	E W E S SSW W	4 Window 4 Window 3 Window 10 Window 16 Window 13 Window	Type 4 Type 4 Type 4 Type 5 Type 5 Type 5	x x x x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>9</sup> x 13.8 ft <sup>10</sup> x	0.24 Shading coemclent	x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor	= = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r
High High GYMVOTECH ELEMMIDDLE ELEMMIDDLE ELEMMIDDLE ELEMMIDDLE	E W E S SSW W E	4 Window 4 Window 3 Window 10 Window 16 Window 13 Window 8 Window	Type 4 Type 4 Type 4 Type 5 Type 5 Type 5 Type 5	x x x x x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>9</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x	0.24 Shading coefficient	x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor	= = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r 13,332 Btu/r
High GYMVOTECH ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE	E W E S SSW W E N	4 Window 4 Window 3 Window 10 Window 16 Window 13 Window 8 Window 4 Window	Type 4 Type 4 Type 4 Type 5 Type 5 Type 5 Type 5 Type 5 Type 5	x x x x x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>9</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x	0.24 Shading coemident	x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor	= = = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r
High GYMVOTECH ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE	E W E S SSW W E N	4 Window 4 Window 3 Window 10 Window 16 Window 13 Window 8 Window 4 Window 16 Window	Type 4 Type 4 Type 4 Type 5	x x x x x x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>9</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>11</sup> x	0.24 Shading coemolent	x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 317 Avg. Solar HG Factor	= = = = = = = = = = = = = = = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r 16,744 Btu/r
High GYMVOTECH ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE ELEWMIDDLE GYMVOTECH	E W E SSW W E N NE S	4 Window 4 Window 3 Window 10 Window 13 Window 13 Window 4 Window 4 Window 4 Window 4 Window 4 Window	Type 4 Type 4 Type 4 Type 5	x x x x x x x x x	19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>9</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>12</sup> x 13.8 ft <sup>13</sup> x	0.24 Shading coemolent	x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 317 Avg. Solar HG Factor 393 Avg. Solar HG Factor	= = = = = = = = = = = = = = = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r 16,744 Btu/r 4,780 Btu/r
High GYMVOTECH BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE GYMVOTECH GYMVOTECH	E W E SSW W E NE S	4 Window 4 Window 3 Window 10 Window 13 Window 8 Window 4 Window 4 Window 4 Window 9 Window 9 Window	Type 4 Type 4 Type 4 Type 5 Type 6 Type 7	x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>9</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>13</sup> x 13.8 ft <sup>13</sup> x 12.8 ft <sup>13</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x	0.24 Shading coemicient	x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 317 Avg. Solar HG Factor 393 Avg. Solar HG Factor 393 Avg. Solar HG Factor	= = = = = = = = = = = = = = = = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r 13,322 Btu/r 2,226 Btu/r 4,780 Btu/r 10,850 Btu/r
High GYMVOTECH BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE GYMVOTECH GYMVOTECH High	E W E SSW W E N NE S S	4 Window 4 Window 3 Window 10 Window 16 Window 8 Window 4 Window 4 Window 9 Window 14 Window	Type 4 Type 4 Type 4 Type 5 Type 6 Type 7 Type 8	x x x x x x x x x x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>0</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>12</sup> x 13.8 ft <sup>12</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x 16.7 ft <sup>16</sup> x	0.24 Shading coemident	x x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 393 Avg. Solar HG Factor	= = = = = = = = = = = = = = = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r 16,744 Btu/r 4,780 Btu/r 10,850 Btu/r 22,015 Btu/r
High GYMVOTECH BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE GYMVOTECH GYMVOTECH High	E W E SSW W E NE S S S E	4 Window 4 Window 3 Window 10 Window 16 Window 8 Window 4 Window 4 Window 9 Window 2 Window 2 Window	Type 4 Type 4 Type 4 Type 5 Type 6 Type 7 Type 8 Type 8	x x x x x x x x x x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>1</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>12</sup> x 13.8 ft <sup>13</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x	0.24 Shading coemicient	x x x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 393 Avg. Solar HG Factor 505 Avg. Solar HG Factor	= = = = = = = = = = = = = = = = = = =	3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r 16,744 Btu/r 4,780 Btu/r 10,850 Btu/r 22,015 Btu/r 4,040 Btu/r
High GYMVOTECH BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE GYMVOTECH GYMVOTECH High High BLEWMIDDLE	E W E SSW W E N NE S S S S S S S S S S S S S S S S	4 Window 4 Window 3 Window 10 Window 13 Window 8 Window 4 Window 4 Window 4 Window 9 Window 14 Window 2 Window	Type 4 Type 4 Type 5 Type 5 Type 5 Type 5 Type 5 Type 5 Type 5 Type 5 Type 6 Type 7 Type 8 Type 8 Type 8	x x x x x x x x x x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>1</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>13</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x 12.7 ft <sup>17</sup> x 8.5 ft <sup>18</sup> x	0.24 Shading coefficient	x x x x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 117 Avg. Solar HG Factor 393 Avg. Solar HG Factor 505 Avg. Solar HG Factor		3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r 16,744 Btu/r 4,780 Btu/r 10,850 Btu/r 4,040 Btu/r 4,040 Btu/r 4,040 Btu/r
High GYMVOTECH BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE GYMVOTECH High High BLEWMIDDLE BLEWMIDDLE	E W E SSW W E N NE S S S S S W W	4 Window 4 Window 3 Window 10 Window 13 Window 8 Window 4 Window 4 Window 9 Window 2 Window 4 Window 2 Window 2 Window	Type 4 Type 4 Type 4 Type 5 Type 6 Type 7 Type 8 Type 8 Type 8 Type 9 Type 9	x x x x x x x x x x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>9</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>13</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x 16.7 ft <sup>16</sup> x 8.5 ft <sup>18</sup> x	0.24 Shading coemident	x x x x x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 393 Avg. Solar HG Factor 505 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor		3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 25,413 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r 16,744 Btu/r 4,780 Btu/r 10,850 Btu/r 22,015 Btu/r 4,040 Btu/r
High GYMVOTECH BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE GYMVOTECH GYMVOTECH High High BLEWMIDDLE	E W E SSW W E N NE S S S S S S S S S S S S S S S S	4 Window 4 Window 3 Window 10 Window 13 Window 8 Window 4 Window 4 Window 4 Window 9 Window 14 Window 2 Window	Type 4 Type 4 Type 4 Type 5 Type 6 Type 6 Type 7 Type 8 Type 8 Type 8 Type 9 Type 9	x x x x x x x x x x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>12</sup> x 13.8 ft <sup>13</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x 16.7 ft <sup>16</sup> x 8.5 ft <sup>19</sup> x 8.5 ft <sup>20</sup> x	0.24 Shading coefficient	x x x x x x x x x x x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 393 Avg. Solar HG Factor 505 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor		3,094 Btu/r 6,444 Btu/r 6,444 Btu/r 4,833 Btu/r 12,973 Btu/r 21,665 Btu/r 13,332 Btu/r 2,226 Btu/r 16,744 Btu/r 4,780 Btu/r 10,850 Btu/r 4,040 Btu/r 4,040 Btu/r 4,040 Btu/r
High GYMVOTECH BLEWMIDDLE	E W E SSW W E N NE S S S S S W W	4 Window 4 Window 3 Window 10 Window 13 Window 8 Window 4 Window 4 Window 9 Window 2 Window 4 Window 2 Window 2 Window	Type 4 Type 4 Type 4 Type 5 Type 6 Type 6 Type 7 Type 8 Type 8 Type 8 Type 9 Type 9	x x x x x x x x x x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>12</sup> x 13.8 ft <sup>13</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x 16.7 ft <sup>16</sup> x 8.5 ft <sup>19</sup> x 8.5 ft <sup>20</sup> x	0.24 Shading coemident	x x x x x x x x x x x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 393 Avg. Solar HG Factor 505 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor		3,094 Btu/l 6,444 Btu/l 6,444 Btu/l 4,833 Btu/l 12,973 Btu/l 25,413 Btu/l 21,665 Btu/l 13,332 Btu/l 2,226 Btu/l 16,744 Btu/l 4,780 Btu/l 10,850 Btu/l 22,015 Btu/l 3,908 Btu/l 2,050 Btu/l
High GYMVOTECH BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE BLEWMIDDLE GYMVOTECH High High BLEWMIDDLE BLEWMIDDLE	E W E SSW W E NE S S S S S S W N	4 Window 4 Window 3 Window 10 Window 13 Window 8 Window 4 Window 4 Window 9 Window 2 Window 4 Window 2 Window 2 Window 2 Window 4 Window 4 Window 4 Window 5 Window 6 Window 7 Window 7 Window 8 Window 9 Window	Type 4 Type 4 Type 4 Type 5 Type 6 Type 6 Type 7 Type 8 Type 8 Type 8 Type 9 Type 9	x x x x x x x x x x x x x x x x x x x	19.1 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>6</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>11</sup> x 13.8 ft <sup>12</sup> x 13.8 ft <sup>13</sup> x 12.7 ft <sup>14</sup> x 12.8 ft <sup>15</sup> x 16.7 ft <sup>16</sup> x 8.5 ft <sup>19</sup> x 8.5 ft <sup>20</sup> x	0.24 Shading coefficient	x x x x x x x x x x x x x x x x x x x	505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 393 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 169 Avg. Solar HG Factor 393 Avg. Solar HG Factor 505 Avg. Solar HG Factor 481 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor 505 Avg. Solar HG Factor		3,094 Btu/l 6,444 Btu/l 6,444 Btu/l 4,833 Btu/l 12,973 Btu/l 25,413 Btu/l 21,665 Btu/l 13,332 Btu/l 2,226 Btu/l 16,744 Btu/l 4,780 Btu/l 10,850 Btu/l 22,015 Btu/l 4,040 Btu/l 3,998 Btu/l 2,050 Btu/l 685 Btu/l

Cooling	Savings	

Existing Cooling Electrical Consumption:											
Fulton 440,117 Btu/hr ÷ 12,000 Btu/Ton x 1.0 kW/ton x 876 FLH =	32,249 kWh/yr										
Total Existing Electrical Consumption: =	32,249 kWh/yr										
Recommended Cooling Electrical Consumption:											
Fulton 188,936 Btu/hr ÷ 12,000 Btu/Ton x 1.0 kW/ton x 876 FLH =	13,844 kWh/yr										
Total Recommended Cooling Electrical Consumption:	13,844 kWh/yr										
Total Cooling Electrical Consumption Savings: =	18,405 kWh/yr										
Cooling - Electrical Demand											
Existing Cooling Electrical Demand:											
Fulton 440,117 Btu/hr ÷ 12,000 Btu/Ton x 1.0 kW/ton x 80% Demand Div.	= 29.46 kW/mo										
Total Existing Cooling Electrical Demand:	= 29.46 kW/mo										
Recommended Cooling Electrical Demand:											
Fulton 188,936 Btu/hr ÷ 12,000 Btu/Ton x 1.0 kW/ton x 80% Demand Div.	= 12.65 kW/mo										
Total Recommended Cooling Electrical Demand:	= 12.65 kW/mo										
Total Cooling Electrical Demand Savings:	= 17 kW/mo										
Assumes 7 months per year usage:											
Annual ⊟ectric Demand Savings:	= 101 kW/yr										



# 2.3 Install Window Film Continued

eating -Conduction xisting Heating Conducti										
ulton @ Outside Temp: 62	131 g	glass w indow s						70 °F   x	2.60% Bin hours @ Temp =	421 Btu
ılton @ Outside Temp: 62		glass w indows						55 °F   x	6.00% Bin hours @ Temp =	852 Btu
ılton @ Outside Temp: 57		glass w indows						70 °F   x	2.31% Bin hours @ Temp =	609 Btu
ılton @ Outside Temp: 57		glass w indows						55 °F   x	5.59% Bin hours @ Temp =	227 Btu
ılton @ Outside Temp: 52		glass w indows						70 °F   x	2.14% Bin hours @ Temp =	780 Btu
ılton @ Outside Temp: 52	131 g	glass w indow s	x 14.07 ft <sup>2</sup>	X	1.10 U-value	Х	52 °F -	55 °F   x	5.04% Bin hours @ Temp =	307 Btu
ılton @ Outside Temp: 47		glass w indows						70 °F   x	1.98% Bin hours @ Temp =	922 Btu
ılton @ Outside Temp: 47	<b>1</b> 31 g	glass w indows	x 14.07 ft <sup>2</sup>	X	1.10 U-value	х	47 °F -	55 °F   x	4.87% Bin hours @ Temp =	790 Btu
ılton @ Outside Temp: 42	131 g	glass w indow s	x 14.07 ft <sup>2</sup>	X	1.10 U-value	х		70 °F   x	1.77% Bin hours @ Temp =	1,006 Btu
ılton @ Outside Temp: 42	131 g	glass w indows	x 14.07 ft <sup>2</sup>	X	1.10 U-value	X	42 °F -	55 °F   x	4.91% Bin hours @ Temp =	1,292 Btu
ılton @ Outside Temp: 37	131 g	glass w indows	x 14.07 ft <sup>2</sup>	X	1.10 U-value	х	7 37 °F -	70 °F   x	1.39% Bin hours @ Temp =	933 Btu
ilton @ Outside Temp: 37	131 g	glass w indows	x 14.07 ft <sup>2</sup>	х	1.10 U-value	х	37 °F - ■	55 °F   x	4.20% Bin hours @ Temp =	1,531 Btu
ılton @ Outside Temp: 32	131 g	glass w indows	x 14.07 ft <sup>2</sup>	x	1.10 U-value	х	32 °F -	70 °F   x	0.95% Bin hours @ Temp =	731 Btu
ulton @ Outside Temp: 32	7131 g	glass w indows	x 14.07 ft2	X	1.10 U-value	х	32 °F -	55 °F   x	3.36% Bin hours @ Temp =	1,567 Btu
ulton @ Outside Temp: 27	131 c	glass w indows	x 14.07 ft <sup>2</sup>	x	1.10 U-value	х	27 °F -	70 °F   x	0.53% Bin hours @ Temp =	458 Bt
ulton @ Outside Temp: 27		glass w indows						55 °F   x	1.90% Bin hours @ Temp =	1,077 Btu
ulton @ Outside Temp: 22	131 g	glass w indows	x 14.07 ft <sup>2</sup>	х	1.10 U-value	х	22 °F -	70 °F   x	0.30% Bin hours @ Temp =	289 Btu
ulton @ Outside Temp: 22		glass windows					22 °F - 🔽	55 °F   x	1.02% Bin hours @ Temp =	681 Btu
ulton @ Outside Temp: 17		glass w indows					17 °F -	70 °F   x	0.14% Bin hours @ Temp =	147 Bt
ulton @ Outside Temp: 17	_	glass w indows						55 °F   x	0.50% Bin hours @ Temp =	387 Bt
ulton @ Outside Temp: 12		glass windows					•	70 °F   x	0.05% Bin hours @ Temp =	54 Bt
ulton @ Outside Temp: 12		glass windows					•	55 °F   x	0.19% Bin hours @ Temp =	169 Bt
ulton @ Outside Temp: 7	_	glass windows	_				12   -   7 °F -	70 °F   x	0.02% Bin hours @ Temp =	29 Bt
ulton @ Outside Temp: 7		glass windows						55 °F   x	0.11% Bin hours @ Temp =	111 Bt
-	_	glass windows glass windows	_				•		0.11% Bin hours @ Temp =	
ulton @ Outside Temp: 2										0 Bt
ulton @ Outside Temp: 2	_	glass windows	_				2 °F -	55 °F   x	0.05% Bin hours @ Temp =	49 Bt
ulton @ Outside Temp: -3		glass windows					-3 °F -	70 °F   x	0.00% Bin hours @ Temp =	0 Bt
itton @ Outside Temp: -3		glass w indow s				X	-3 °F -	55 °F   x	0.01% Bin hours @ Temp =	13 Bt
ılton @ Outside Temp: -8		glass w indows					-8 °F -	70 °F   x	0.00% Bin hours @ Temp =	0 Bt
lton @ Outside Temp: -8		glass w indow s					-8 °F -	55 °F   x	0.00% Bin hours @ Temp =	0 Bt
lton @ Outside Temp: -13	131 g	glass w indow s	x 14.07 ft <sup>2</sup>	×	1.10 U-value	X	-13 °F -	70 °F   x	0.00% Bin hours @ Temp =	0 Bt
lton @ Outside Temp: -13	131 g	glass w indow s	x 14.07 ft <sup>2</sup>	X	1.10 U-value	Х	-13 °F -	55 °F   x	0.00% Bin hours @ Temp =	0 Bt
lton @ Outside Temp: -18	131 g	glass w indow s	x 14.07 ft <sup>2</sup>	X	1.10 U-value	Х	-18 °F -	70 °F   x	0.00% Bin hours @ Temp =	0 Bt
ılton @ Outside Temp: -18	131 g	glass w indow s	x 14.07 ft <sup>2</sup>	X	1.10 U-value	X	-13 °F -	55 °F   x	0.00% Bin hours @ Temp =	0 Bt
tal Existing Heating Conduc	tion:								=	15,433 Bt
ecommended Heating C	onducti	ion:								
ılton @ Outside Temp: 62	131 g	glass w indows	x 14.1 ft <sup>2</sup>	x	0.77 U-value	х	62 °F -	70 °F   x	2.60% Bin hours @ Temp =	295 Bt
ılton @ Outside Temp: 62	131 g	glass w indows	x 14.1 ft <sup>2</sup>	×	0.77 U-value	X	62 °F -	55 °F   x	6.00% Bin hours @ Temp =	596 Bt
ulton @ Outside Temp: 57	131 g	glass w indows	x 14.1 ft <sup>2</sup>	х	0.77 U-value	х	57 °F -	70 °F   x	2.31% Bin hours @ Temp =	426 Bt
ulton @ Outside Temp: 57	_	glass windows			0.77 U-value		57 °F -	55 °F   x	5.59% Bin hours @ Temp =	159 Bt
ulton @ Outside Temp: 52	_	_			0.77 U-value	х	52 °F -	70 °F   x	2.14% Bin hours @ Temp =	546 Bt
ulton @ Outside Temp: 52					0.77 U-value	x	52 °F -	55 °F   x	5.04% Bin hours @ Temp =	215 Bt
itton @ Outside Temp: 47	_	glass windows	_		0.77 U-value	x	47 °F -	70 °F   x	1.98% Bin hours @ Temp =	646 B
ilton @ Outside Temp: 47		glass windows			0.77 U-value		47 °F -	55 °F   x	4.87% Bin hours @ Temp =	553 B
	_	-	_				•			
Ilton @ Outside Temp: 42	_	glass w indows	_		0.77 U-value	х	42 °F -	70 °F   x	1.77% Bin hours @ Temp =	704 B
Iton @ Outside Temp: 42	_				0.77 U-value	х	42 °F -	55 °F   x	4.91% Bin hours @ Temp =	905 B
Iton @ Outside Temp: 37		glass windows	_		0.77 U-value		•	70 °F   x	1.39% Bin hours @ Temp =	653 Bt
ilton @ Outside Temp: 37	_	glass windows	_		0.77 U-value			55 °F   x	4.20% Bin hours @ Temp =	1,072 B
ıtton @ Outside Temp: 32	_	glass windows			0.77 U-value			70 °F   x	0.95% Bin hours @ Temp =	512 Bt
ılton @ Outside Temp: 32		_			0.77 U-value	X	32 °F -	55 °F   x	3.36% Bin hours @ Temp =	1,097 Bt
lton @ Outside Temp: 27	131 c	glass w indow s	x 14.1 ft <sup>2</sup>		0.77 U-value	X	27 °F -	70 °F   x	0.53% Bin hours @ Temp =	
	_						•			321 B
lton @ Outside Temp: 27	_	glass w indows	x 14.1 ft <sup>2</sup>	X	0.77 U-value	x	•	55 °F   x	1.90% Bin hours @ Temp =	
	131 g	glass w indows glass w indows	_		0.77 U-value 0.77 U-value		•			754 B
ton @ Outside Temp: 22	131 g 131 g	_	x 14.1 ft <sup>2</sup>	×			27 °F -	55 °F   x	1.90% Bin hours @ Temp =	754 B 202 B
tton @ Outside Temp: 22 tton @ Outside Temp: 22	131 g 131 g 131 g	glass w indows glass w indows	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x	0.77 U-value	X	27 °F -   22 °F -	55 °F   x 70 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp =	754 B 202 B 476 B
tton @ Outside Temp: 22 tton @ Outside Temp: 22 tton @ Outside Temp: 17	131 g 131 g 131 g 131 g	glass w indows glass w indows	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x x	0.77 U-value 0.77 U-value	x x	27 °F -   22 °F -   22 °F -   17 °F -	55 °F   x 70 °F   x 55 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp =	754 B 202 B 476 B 103 B
tton @ Outside Temp: 22 tton @ Outside Temp: 22 tton @ Outside Temp: 17 tton @ Outside Temp: 17	131 g 131 g 131 g 131 g 131 g	glass w indows glass w indows glass w indows glass w indows	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x x x	0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value	x x x	27 °F -   22 °F -   22 °F -   17 °F -   17 °F -	55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp = 0.50% Bin hours @ Temp =	754 B 202 B 476 B 103 B 271 B
tton @ Outside Temp: 22 tton @ Outside Temp: 22 tton @ Outside Temp: 17 tton @ Outside Temp: 17 tton @ Outside Temp: 12	131 g 131 g 131 g 131 g 131 g	glass w indow s glass w indow s glass w indow s glass w indow s glass w indow s	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x x x x	0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value	x x x x	27 °F - 22 °F - 22 °F - 17 °F - 17 °F - 12 °F -	55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x 70 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp = 0.50% Bin hours @ Temp = 0.05% Bin hours @ Temp =	754 B 202 B 476 B 103 B 271 B 38 B
tton @ Outside Temp: 22 tton @ Outside Temp: 22 tton @ Outside Temp: 17 tton @ Outside Temp: 17 tton @ Outside Temp: 12	131 g 131 g 131 g 131 g 131 g	glass w indows glass w indows glass w indows glass w indows	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x x x x	0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value	x x x x	27 °F - 22 °F - 22 °F - 17 °F - 17 °F - 12 °F -	55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp = 0.50% Bin hours @ Temp =	754 B 202 B 476 B 103 B 271 B 38 B
ton @ Outside Temp: 22 ton @ Outside Temp: 22 ton @ Outside Temp: 17 ton @ Outside Temp: 17 ton @ Outside Temp: 12 ton @ Outside Temp: 12	131 g 131 g 131 g 131 g 131 g 131 g	glass w indows glass w indows glass w indows glass w indows glass w indows glass w indows	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x x x x	0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value	x x x x	27 °F - 22 °F - 22 °F - 17 °F - 17 °F - 12 °F - 12 °F -	55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp = 0.50% Bin hours @ Temp = 0.05% Bin hours @ Temp =	754 B 202 B 476 B 103 B 271 B 38 B 119 B
ton @ Outside Temp: 22 ton @ Outside Temp: 22 ton @ Outside Temp: 17 ton @ Outside Temp: 17 ton @ Outside Temp: 12 ton @ Outside Temp: 12 ton @ Outside Temp: 7	131 g 131 g 131 g 131 g 131 g 131 g 131 g	glass windows glass windows glass windows glass windows glass windows glass windows glass windows	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x x x x x	0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value 0.77 U-value	x x x x x	27 °F - 22 °F - 22 °F - 17 °F - 17 °F - 12 °F - 12 °F - 17 °F -	55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x 70 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp = 0.50% Bin hours @ Temp = 0.05% Bin hours @ Temp = 0.19% Bin hours @ Temp = 0.02% Bin hours @ Temp =	754 B 202 B 476 B 103 B 271 B 38 B 119 B
ton @ Outside Temp: 22 ton @ Outside Temp: 22 ton @ Outside Temp: 17 ton @ Outside Temp: 17 ton @ Outside Temp: 12 ton @ Outside Temp: 12 ton @ Outside Temp: 7 ton @ Outside Temp: 7 ton @ Outside Temp: 7	131 g 131 g 131 g 131 g 131 g 131 g 131 g	glass windows	x 14.1 ft <sup>2</sup> x 14.1 ft <sup>2</sup>	x x x x x x	0.77 U-value	x x x x x x	27 °F - 22 °F - 22 °F - 17 °F - 17 °F - 12 °F - 12 °F - 17 °F - 7 °F -	55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x 70 °F   x 55 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp = 0.50% Bin hours @ Temp = 0.05% Bin hours @ Temp = 0.02% Bin hours @ Temp = 0.02% Bin hours @ Temp = 0.11% Bin hours @ Temp = 0.11% Bin hours @ Temp =	754 B 202 B 476 B 103 B 271 B 38 B 119 B 20 B 78 B
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alton @ Outside Temp: 27 alton @ Outside Temp: 22 alton @ Outside Temp: 22 alton @ Outside Temp: 17 alton @ Outside Temp: 17 alton @ Outside Temp: 17 alton @ Outside Temp: 12 alton @ Outside Temp: 12 alton @ Outside Temp: 7 alton @ Outside Temp: 7 alton @ Outside Temp: 7 alton @ Outside Temp: 2 alton @ Outside Temp: 2 alton @ Outside Temp: 3 alton @ Outside Temp: -3 alton @ Outside Temp: -3 alton @ Outside Temp: -8	131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9 131 9	glass w indows	x 14.1 ft²	x x x x x x x x x x x x x x x x x x x	0.77 U-value	x x x x x x x x x x x x x x x x x x x	27 °F -   22 °F -   22 °F -   17 °F -   12 °F -   7 °F -   7 °F -   2 °F -   2 °F -   3 °F -   -3 °F -   -8 °F -   -8 °F -   -13 °F -   -15 °	55 °F   x 70 °F   x 55 °F   x	1.90% Bin hours @ Temp = 0.30% Bin hours @ Temp = 1.02% Bin hours @ Temp = 0.14% Bin hours @ Temp = 0.50% Bin hours @ Temp = 0.05% Bin hours @ Temp = 0.19% Bin hours @ Temp = 0.02% Bin hours @ Temp = 0.011% Bin hours @ Temp = 0.00% Bin hours @ Temp = 0.00% Bin hours @ Temp = 0.00% Bin hours @ Temp = 0.01% Bin hours @ Temp = 0.01% Bin hours @ Temp = 0.00% Bin hours @ Te	754 B 202 B 476 B
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# 2.3 Install Window Film Continued

Heating - Solar										
Existing Heating Sola					•					
High	E	3 Window Type 1	Х		0.57 Shading Coefficient		382 Avg.	Solar HG Factor	=	4,083 Btu/hr
ELEWMIDDLE	N	5 Window Type 2	X	13.3 ft <sup>3</sup> x	0.57 Shading Coefficient	х	94 Avg.	Solar HG Factor	=	3,553 Btu/hr
GYM/VOTECH	N	4 Window Type 3	X		0.57 Shading Coefficient		94 Avg.	Solar HG Factor	=	4,074 Btu/hr
High	E	4 Window Type 4	X	13.3 ft <sup>s</sup> x	0.57 Shading Coefficient	х	382 Avg.	Solar HG Factor	=	11,577 Btu/hr
High	W	4 Window Type 4	X	13.3 ft <sup>6</sup> x	0.57 Shading Coefficient	х	382 Avg.	Solar HG Factor	=	11,577 Btu/hr
GYMVOTECH	E	3 Window Type 4	X	13.3 ft <sup>7</sup> x	0.57 Shading Coefficient	х	382 Avg.	Solar HG Factor	=	8,682 Btu/hr
ELEWMIDDLE	S	10 Window Type 5	X	13.8 ft <sup>8</sup> x	0.57 Shading Coefficient	х	769 Avg.	Solar HG Factor	=	60,231 Btu/hr
ELEWMIDDLE	SSW	16 Window Type 5	X	13.8 ft <sup>9</sup> x	0.57 Shading Coefficient	х	726 Avg.	Solar HG Factor	=	91,025 Btu/hr
ELEWMIDDLE	W	13 Window Type 5	X	13.8 ft <sup>10</sup> x	0.57 Shading Coefficient	х	382 Avg.	Solar HG Factor	=	38,921 Btu/hr
ELEWMIDDLE	E	8 Window Type 5	Х	13.8 ft <sup>11</sup> x	0.57 Shading Coefficient	х	382 Avg.	Solar HG Factor	=	23,951 Btu/hr
ELEWMIDDLE	N	4 Window Type 5	Х	13.8 ft <sup>12</sup> x	0.57 Shading Coefficient	х	94 Avg.	Solar HG Factor	=	2,931 Btu/hr
ELEWMIDDLE	NE	16 Window Type 5	X	13.8 ft <sup>13</sup> x	0.57 Shading Coefficient	х	141 Avg.	Solar HG Factor	=	17,634 Btu/hr
GYMVOTECH	S	4 Window Type 6	X	12.7 ft <sup>14</sup> x	0.57 Shading Coefficient	х	769 Avg.	Solar HG Factor	=	22,194 Btu/hr
GYM/VOTECH	S	9 Window Type 7	Х	12.8 ft <sup>15</sup> x	0.57 Shading Coefficient	х	769 Avg.	Solar HG Factor	=	50,375 Btu/hr
High	S	14 Window Type 8	X	16.7 ft <sup>16</sup> x	0.57 Shading Coefficient	х	769 Avg.	Solar HG Factor	=	102,211 Btu/hr
High	E	2 Window Type 8	X	16.7 ft <sup>17</sup> x	0.57 Shading Coefficient	х	382 Avg.	Solar HG Factor	=	7,258 Btu/hr
ELEWMIDDLE	SSW	4 Window Type 9	X	8.5 ft <sup>18</sup> x	0.57 Shading Coefficient	х	726 Avg.	Solar HG Factor	=	13,998 Btu/hr
ELEWMIDDLE	W	2 Window Type 9	X		0.57 Shading Coefficient		382 Avg.	Solar HG Factor	=	3,683 Btu/hr
ELEWMIDDLE	N	2 Window Type 9	X	8.5 ft <sup>20</sup> x	0.57 Shading Coefficient	х	94 Avg.	Solar HG Factor	=	902 Btu/hr
High	W	4 Window Type 1	0 x	28.3 ft <sup>21</sup> x	0.57 Shading Coefficient	х	382 Avg.	Solar HG Factor	=	24,677 Btu/hr
Total Existing Heating 9	Solar Load:								=	503,538 Btu/hr
Recommended Coo										
High	E	3 Window Type 1			0.24 Shading Coefficient			Solar HG Factor		1,719 Btu/hr
High ELEWMIDOLE	E N	5 Window Type 2	X	13.3 ft <sup>3</sup> x	0.24 Shading Coefficient	х	94 Avg.	Solar HG Factor	=	1,496 Btu/hr
High ELEM/MIDDLE GYM/VOTECH	E N N	5 Window Type 2 4 Window Type 3	X X	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x	0.24 Shading Coefficient 0.24 Shading Coefficient	x x	94 Avg. 94 Avg.	Solar HG Factor Solar HG Factor	=	1,496 Btu/hr 1,715 Btu/hr
High ELEWIMIDDLE GYMV/OTECH High	E N N E	5 Window Type 2 4 Window Type 3 4 Window Type 4	X X	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x	0.24 Shading Coefficient 0.24 Shading Coefficient 0.24 Shading Coefficient	x x x	94 Avg. 94 Avg. 382 Avg.	Solar HG <sub>Factor</sub> Solar HG <sub>Factor</sub> Solar HG <sub>Factor</sub>	= =	1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr
High ELEWMIDDLE GYMVOTECH High High	E N N E	5 Window Type 2 4 Window Type 3 4 Window Type 4 4 Window Type 4	x x x	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x	0.24 Shading Coefficient 0.24 Shading Coefficient 0.24 Shading Coefficient 0.24 Shading Coefficient	x x x	94 Avg. 94 Avg. 382 Avg. 382 Avg.	Solar HG Factor Solar HG Factor Solar HG Factor Solar HG Factor	= = = =	1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr 4,874 Btu/hr
High ELEWIMDOLE GYMVOTECH High High GYMVOTECH	E N N E W	5 Window Type 2 4 Window Type 3 4 Window Type 4 4 Window Type 4 3 Window Type 4	x x x x	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x	0.24 Shading coefficient	x x x x	94 Avg. 94 Avg. 382 Avg. 382 Avg. 382 Avg.	Solar HG Factor Solar HG Factor Solar HG Factor Solar HG Factor Solar HG Factor	= = = =	1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr 4,874 Btu/hr 3,656 Btu/hr
High BLEWMIDDLE GYMVOTECH High High GYMVOTECH BLEWMIDDLE	E N N E W E S	5 Window Type 2 4 Window Type 3 4 Window Type 4 4 Window Type 4 3 Window Type 4 10 Window Type 5	x x x x x	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x	0.24 Shading coencient	x x x x x	94 Avg. 94 Avg. 382 Avg. 382 Avg. 382 Avg. 769 Avg.	Solar HG <sub>Factor</sub> Solar HG <sub>Factor</sub> Solar HG <sub>Factor</sub> Solar HG <sub>Factor</sub> Solar HG <sub>Factor</sub>	= = = = = = = = = = = = = = = = = = = =	1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr 4,874 Btu/hr 3,656 Btu/hr 25,361 Btu/hr
High ELEWIMDOLE GYMV/OTECH High High GYMV/OTECH ELEWIMDOLE ELEWIMDOLE	E N N E W E S	5 Window Type 2 4 Window Type 3 4 Window Type 4 4 Window Type 4 3 Window Type 4 10 Window Type 5 16 Window Type 5	x x x x x	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>8</sup> x	0.24 Shading Coefficient	x x x x x x	94 Avg. 94 Avg. 382 Avg. 382 Avg. 382 Avg. 769 Avg. 726 Avg.	Solar HG Factor Solar HG Factor Solar HG Factor Solar HG Factor Solar HG Factor Solar HG Factor Solar HG Factor	= = = = = = = = = = = = = = = = = = = =	1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr 4,874 Btu/hr 3,656 Btu/hr 25,361 Btu/hr 38,326 Btu/hr
High ELEWMDDLE GYMVOTECH High High GYMVOTECH ELEWMDDLE ELEWMDDLE ELEWMDDLE	E N N E W E S SSW	5 Window Type 2 4 Window Type 3 4 Window Type 4 4 Window Type 4 3 Window Type 4 10 Window Type 5 16 Window Type 5 13 Window Type 5	x x x x x x	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>5</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>9</sup> x	0.24 Shading coefficient	x x x x x x x	94 Avg. 94 Avg. 382 Avg. 382 Avg. 382 Avg. 769 Avg. 726 Avg. 382 Avg.	Solar HG Factor Solar HG Factor	= = = = = = = = = = = = = = = = = = = =	1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr 4,874 Btu/hr 3,656 Btu/hr 25,361 Btu/hr 38,326 Btu/hr 16,388 Btu/hr
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High ELEWMDOLE GYMV/OTECH High High GYMV/OTECH ELEWMDOLE ELEWMDOLE ELEWMDOLE ELEWMDOLE ELEWMDOLE ELEWMDOLE GYMV/OTECH GYMV/OTECH GYMV/OTECH High High ELEWMDOLE ELEWMDOLE ELEWMDOLE ELEWMDOLE ELEWMDOLE ELEWMDOLE ELEWMDOLE	E N N E W E SSW W E N E SSW W N N N S S S S W W N N S S S S S W W N W	5 Window Type 2 4 Window Type 3 4 Window Type 4 4 Window Type 4 3 Window Type 4 10 Window Type 5 16 Window Type 5 8 Window Type 5 4 Window Type 5 16 Window Type 5 4 Window Type 5 4 Window Type 5 9 Window Type 7 14 Window Type 8 2 Window Type 8 4 Window Type 9 2 Window Type 9 2 Window Type 9 2 Window Type 9	x x x x x x x x x x x x x x x x x x x	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>1</sup>	0.24 Shading coefficient	x x x x x x x x x x x x x x x x x x x	94 Avg. 94 Avg. 382 Avg. 382 Avg. 769 Avg. 726 Avg. 382 Avg. 382 Avg. 94 Avg. 141 Avg. 769 Avg. 769 Avg. 382 Avg. 769 Avg. 382 Avg. 726 Avg. 382 Avg. 94 Avg.	Solar HG Pactor		1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr 4,874 Btu/hr 3,656 Btu/hr 38,326 Btu/hr 16,388 Btu/hr 10,085 Btu/hr 1,234 Btu/hr 7,425 Btu/hr 7,425 Btu/hr 7,425 Btu/hr 21,211 Btu/hr 43,036 Btu/hr 3,056 Btu/hr 5,894 Btu/hr 1,551 Btu/hr 380 Btu/hr
High ELEWIMDOLE GYMV/OTECH High High GYMV/OTECH ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE HEMMOOLE GYMV/OTECH High High High ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE ELEWIMDOLE	E N N E W E S SSW W E N E S SSW W W W eating Solar Lo	5 Window Type 2 4 Window Type 3 4 Window Type 4 4 Window Type 4 3 Window Type 4 10 Window Type 5 16 Window Type 5 8 Window Type 5 4 Window Type 5 16 Window Type 5 16 Window Type 5 16 Window Type 5 2 Window Type 8 2 Window Type 8 2 Window Type 8 2 Window Type 9 2 Window Type 9 2 Window Type 9 2 Window Type 9 4 Window Type 9 4 Window Type 1 oad:	x x x x x x x x x x x x x x x x x x x	13.3 ft <sup>3</sup> x 19.1 ft <sup>4</sup> x 13.3 ft <sup>6</sup> x 13.3 ft <sup>7</sup> x 13.3 ft <sup>7</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>8</sup> x 13.8 ft <sup>10</sup> x 13.8 ft <sup>1</sup>	0.24 Shading coefficient	x x x x x x x x x x x x x x x x x x x	94 Avg. 94 Avg. 382 Avg. 382 Avg. 769 Avg. 726 Avg. 382 Avg. 382 Avg. 94 Avg. 141 Avg. 769 Avg. 769 Avg. 382 Avg. 769 Avg. 382 Avg. 726 Avg. 382 Avg. 94 Avg.	Solar HG Pactor		1,496 Btu/hr 1,715 Btu/hr 4,874 Btu/hr 4,874 Btu/hr 3,656 Btu/hr 25,361 Btu/hr 38,326 Btu/hr 16,388 Btu/hr 10,085 Btu/hr 1,234 Btu/hr 1,234 Btu/hr 7,425 Btu/hr 21,211 Btu/hr 43,036 Btu/hr 3,056 Btu/hr 5,894 Btu/hr 1,551 Btu/hr 380 Btu/hr

He ating	- Natura	I Gas Co	onsumptio	<u>n</u>
Existing	Natural	GasCor	sumption	:
			0=	

Fulton -488,104 Btu/hr ÷ 68 °F x 67,714 hr- °F ÷ 80% Comb.<sub>eff.</sub> ÷ 91,500 Btu/GAL = -6,640 Gal/yr Total Existing Natural Gas Consumption: = -6,640 Gal/yr

Recommended Heating Natural Gas Comsumption: Fulton -201,213 Btu/hr  $\div$  68 °F x 67,714 hr- °F  $\div$  80% Comb.<sub>eff.</sub> Total Recommended Natural Gas Consumption: 91,500 Btu/GAL = -2,737 Gal/yr = -2,737 Gal/yr -3,903 Gal/yr Total Heating Natural Gas Consumption Savings:

## 2.4 Computer Plug Loads – Management Software

#### **Affected School Rooms**

Classrooms

#### **Existing Conditions**

Desktop computers in classrooms remain on at all times throughout the school year, some of which not even being put into a low power or sleep mode. The computers stay on most likely due to the age of the hardware and the slow start-up times associated with dated systems running newer programming.

#### **Upgrade Recommendation**

It is recommended that the IT department implement the use of software to control the computers to enter a sleep mode at a specified time each day, regardless of processes left open on the device. It is the assumption that the computer management software will force sleep mode on both the computer and monitor. This does not include any assumption of a computer management system on laptops used by the teachers.

#### **Quality of Life Implications**

This is purely an energy saving measure.

#### **Specifications**



# 2.4 Computer Plug Loads

#### Computer Management (Current Idle Conditions)

Equipment	Qty.	Volts	Watts	kW	Corr. Factor	Adjusted kW	kWh/year	\$/year
Computers (Idle)	131	115	100	13.100	1.000	13.100	95,892	\$11,834.17
Monitor	131	115	35	4.585	1.000	4.585	33,562	\$4,141.96
						Total:	129,454.2	\$15,976.13

#### Computer Management (Proposed Sleep Conditions)

Equipment	Qty.	Volts	Watts	kW	Corr. Factor	Adjusted kW	kWh/year	\$/year
Computers (Idle)	131	115	6	0.786	1.000	0.786	5,754	\$710.05
Monitor	131	115	7.5	0.983	1.000	0.983	7,192	\$887.56
						Total:	12,945.4	\$1,597,61

Total Savings: 116,508.8 \$14,378.52

## 2.5 Vending Machine Controls

#### **Affected School Rooms**

Middle/Elementary Teacher's Lounge, Football Concessions, Basketball Concessions, Cafeteria, High School Main Office, Football Locker Trailer, High School Principal Office

#### **Existing Conditions**

Currently one vending machine in the middle/elementary teacher's lounge, one full-size double-door merchandiser in the football concessions, two full-size double-door merchandisers in the basketball concessions, one full-size single-door merchandiser in the cafeteria, one half-size single-door merchandiser in the high school main office, one half-size single-door merchandiser in the football locker trailer, and one half-size single-door merchandiser in the high school principal office are plugged in and running at all times. There are times where the vending machine and merchandisers are not used, and can be shutoff to reduce energy consumption.

#### **Upgrade Recommendation**

Install Vending Miser controls on the existing vending machines and merchandisers to turn the machines off during periods of no occupancy. These controls will turn the machines on during unoccupied hours as needed for maintaining the temperature of the contents.

#### **Quality of Life Implications**

This is purely an energy saving measure.

# **Specifications**



# 2.5 Vending Machine Controls

#### Vending Miser Savings

Equipment	Qty.	Volts	Watts	kW	Corr. Factor	Adjusted kW	kWh/year	\$/year
Full-Size, Two-Door Glass Merchandisers	3	115	385	1.155	0.250	0.289	1,686	\$208.11
Full-Size, One-Door Glass Merchandisers	1	115	265	0.265	0.250	0.066	387	\$47.75
Half-Size, One-Door Glass Merchandisers	3	115	165	0.495	0.250	0.124	723	\$89.19
Vending Machine	1	115	920	0.920	0.250	0.230	1,343	\$165.77
						Total		
						Savings:	4.139.1	\$510.81

# 2.6 Ice Machine and Refrigerated Cases

#### **Affected School Rooms**

Kitchen and Cafeteria

#### **Existing Conditions**

Currently there is one ice machine cafeteria that are plugged in throughout the summer and other extended breaks.

#### **Upgrade Recommendation**

Initiate a plan that the ice machine shall be unplugged during summer and other extended breaks.

# **Quality of Life Implications**

This is purely an energy saving measure.

# **Specifications**



# 2.6 Ice Machine & Refrigerated Cases

#### Ice Machine and Refrigerated Cases Savings

Equipment	Qty.	Volts	Watts	kW	Corr. Factor	Adjusted kW	kWh/year	\$/year
Ice Machine	1	115	400	0.400	0.250	0.100	144	\$17.77

Total

Savings: 144 \$17.77

# 2.7 HVAC Controls - Labor Only

#### **Affected School Rooms**

Αll

#### **Existing Conditions**

There are many spaces throughout the school that have new programmable thermostats from recent equipment replacements. These thermostats have varying schedules and setpoints. Most of the older units are on a DDC control system that does have occupancy schedules and unoccupied setback. The DDC control system does vary the start time for demand reduction. The DDC control system provides temperature scheduling with occupied setpoints of 73°F cooling and 70°F heating and unoccupied setpoints of 90°F cooling and 55°F heating. The start times for the units are varied in the schedule to reduce demand at the start of occupancy.

#### **Upgrade Recommendation**

Standardize the programmable thermostat setpoints and ensure all schedules are accurate for the space. It is recommended that the space setpoints be programmed to match the DDC control system. Those occupied setpoints are 73°F cooling and 70° heating and the unoccupied setpoints are 90°F cooling and 55°F heating. The start times could still be varied similar to the existing DDC control system to reduce demand at morning warm up.

### **Quality of Life Implications**

This is purely an energy saving measure.



# 2.7 HVAC Controls

#### Cooling - Electrical Consumption

Existing Cooling Electrical Consumption:

GYMLOCKERS	1	Qty	7.5 tons	X	876 FLH x	1.18 kW/ton	=	7,699 kWh/yr
GYM	2	Qty	40.0 tons	X	876 FLH x	0.95 kW/ton	=	66,696 kWh/yr
LIBRARY	2	Qty	4.0 tons	X	876 FLH x	1.00 kW/ton	=	7,006 kWh/yr
ELEM & MIDDLE CLASSROOMS	33	Qty	2.0 tons	X	876 FLH x	1.00 kW/ton	=	57,799 kWh/yr
ELEM GYM	1	Qty	6.0 tons	X	876 FLH x	1.10 kW/ton	=	5,780 kWh/yr
ELEM GYM	2	Qty	15.0 tons	X	876 FLH x	1.09 kW/ton	=	28,637 kWh/yr

Total Existing Cooling Electrical Consumption: = 173,617 kWh/yr

Recommended Cooling Electrical Consumption:

GYMLOCKERS	1 Qty	7.5 tons	Х	800 FLH x	1.18 kW/ton	=	7,032 kWh/yr
GYM	2 Qty	40.0 tons	X	800 FLH x	0.95 kW/ton	=	60,919 kWh/yr
LIBRARY	2 Qty	4.0 tons	Х	800 FLH x	1.00 kW/ton	=	6,399 kWh/yr
ELEM & MIDDLE CLASSROOMS	33 Qty	2.0 tons	х	800 FLH x	1.00 kW/ton	=	52,793 kWh/yr
ELEM GYM	1 Qty	6.0 tons	х	800 FLH x	1.10 kW/ton	=	5,279 kWh/yr
ELEM GYM	2 Qty	15.0 tons	х	800 FLH x	1.09 kW/ton	=	26,156 kWh/yr

Total Recommended Cooling Electrical Consumption: = 158,578 kWh/yr Total Cooling Electrical Consumption Savings: = 15,038 kWh/yr

#### Heating - Natural Gas Consumption

Existing Heating Natural GasConsumption:	
GYMLOCKERS	
GYM	

GYMLOCKERS	1	Qty	37,250 Btu/hr	÷	72	٩F	X	67,714 hr- °F ÷ 80%	Comb.eff.	÷	91,500 Btu/GAL	=	479 Gal/yr
GYM	2	Qty	200,000 Btu/hr	÷	72	°F	X	67,714 hr- °F ÷ 80%	Comb.eff.	÷	91,500 Btu/GAL	=	5,139 Gal/yr
LIBRARY	2	Qty	20,000 Btu/hr	÷	72	°F	X	67,714 hr- °F ÷ 80%	Comb.eff.	÷	91,500 Btu/GAL	=	514 Gal/yr
ELEM & MIDDLE CLASSROOMS	33	Qty	10,000 Btu/hr	÷	72	°F	X	67,714 hr- °F ÷ 80%	Comb.eff.	÷	91,500 Btu/GAL	=	4,240 Gal/yr
ELEM GYM	1	Qty	30,000 Btu/hr	÷	72	°F	X	67,714 hr- °F ÷ 80%	Comb.eff.	÷	91,500 Btu/GAL	=	385 Gal/yr
ELEM GYM	2	Qty	75,000 Btu/hr	÷	72	°F	X	67,714 hr- °F ÷ 80%	Comb.eff.	÷	91,500 Btu/GAL	=	1,927 Gal/yr

= 12,684 Gal/yr Total Existing Heating Natural Gas Consumption:

Recommended Natural Gas Consumption:

GYMLOCKERS	1	Qty	37,250 Btu/hr	÷	72	٩F	x	45,568 hr- °F ÷ 80% Comb.eff. ÷	91,500 Btu/GAL	=	322 Gal/yr
GYM	2	Qty	200,000 Btu/hr	÷	72	°F	X	45,568 hr- °F ÷ 80% Comb.eff. ÷	91,500 Btu/GAL	=	3,458 Gal/yr
LIBRARY	2	Qty	20,000 Btu/hr	÷	72	°F	X	45,568 hr- °F ÷ 80% Comb.eff. ÷	91,500 Btu/GAL	=	346 Gal/yr
ELEM & MIDDLE CLASSROOMS	33	Qty	10,000 Btu/hr	÷	72	°F	X	45,568 hr- °F ÷ 80% Comb.eff. ÷	91,500 Btu/GAL	=	2,853 Gal/yr
ELEM GYM	1	Qty	30,000 Btu/hr	÷	72	°F	X	45,568 hr- °F ÷ 80% Comb.en. ÷	91,500 Btu/GAL	=	259 Gal/yr
ELEM GYM	2	Qty	75,000 Btu/hr	÷	72	°F	X	45,568 hr- °F ÷ 80% Comb., ÷	91,500 Btu/GAL	=	1,297 Gal/yr

Total Recommended Heating Natural Gas Consumption Savings:

= 8,536 Gal/yr

Total Heating Natural Gas Consumption:

= 4,148 Gal/yr

# 2.8 Install Door Weatherstripping

#### **Affected School Rooms**

Corridors

# **Existing Conditions**

There are exterior doors throughout the school buildings. All of the doors have weatherstripping that is in various states of effectiveness. Particular areas of issues are at the center posts for double doors and at the thresholds.

#### **Upgrade Recommendation**

Install new weatherstripping on all exterior doors. This includes all for sides of each door. One door in the Votech corridor also had an open hole through the door that should be patched.

### **Quality of Life Implications**

In addition to the energy savings, this will also limit uncomfortable drafts that negatively affect occupants.



# 2.8 Door Weatherstripping

Existing Cooling	Infiltration:									
High School	12 doors	x 6.00	cfm/door	X	(43.5-3	0.0)	Dh x	4.5 =	4,374	Btu/hr
⊟em / Middle	14 doors	x 6.00	cfm/door	X	(43.5-3)	0.0)	Dh x	4.5 =	5,103	Btu/hr
⊟em Gym	10 doors	x 6.00	cfm/door	X	(43.5-3)	0.0)	Dh x	4.5 =	3,645	Btu/hr
Gym / Votech	11 doors	x 10.00	cfm/door	X	(43.5-3	0.0)	Dh x	4.5 =	6,683	Btu/hr
Total Existing Coo	ling Infiltration Lo	ad:						=	4,374	Btu/hr
Recommended	Cooling Infiltra	ation:								
High School	12 doors	x 2.00	cfm/door	X	(43.5-3	0.0)	Dh x	4.5 =	1,458	Btu/hr
⊟em / Middle	14 doors	x 2.00	cfm/door	X	(43.5-3	0.0)	Dh x	4.5 =	1,701	Btu/hr
⊟em Gym	10 doors	x 2.00	cfm/door		(43.5-3			4.5 =	1,215	
Gym / Votech	11 doors	x 2.00	cfm/door		(43.5-3			4.5 =	1,337	
Total Recommend								=	1,458	
Total Cooling Infilt	_							=	2,916	
rotal cooling in its	allori Loud ribut	iotion.							2,010	Diam
Cooling Savings	:									
Existing Cooling	<b>Electrical Con</b>	sumptic	n:							
High School	4,374 Btu/hr ÷	12,000	ton/Btu x	1.10	kW/ton	ı X	800 F	LH =	321 k	Wh/yr
Elem / Middle	5,103 Btu/hr ÷	12,000	ton/Btu x	1.00	kW/ton	X	800 F	LH =	340 k	Wh/yr
Elem Gym	3,645 Btu/hr ÷	12,000	ton/Btu >	1.10	kW/ton	X	800 F	LH =	267 k	Wh/yr
Gym / Votech	6,683 Btu/hr ÷	12,000	ton/Btu x	0.95	kW/ton	X	800 F	LH =	423 k	Wh/yr
Total Existing Elec	trical Consumption	n:						=	321 k	Wh/yr
Recommended	Cooling Electri	cal Cons	sumption	:						
High School	1,458 Btu/hr ÷	12,000	ton/Btu >	1.10	kW/ton	ı x	800 F	LH =	107 k	Wh/yr
Elem / Middle	1,701 Btu/hr ÷	12,000	ton/Btu >	1.00	kW/ton	X	800 F	LH =	113 k	Wh/yr
Elem Gym	1,215 Btu/hr ÷	12,000	ton/Btu x	1.10	kW/ton	X	800 F	LH =	89 k	Wh/yr
Gym / Votech	1,337 Btu/hr ÷	12,000	ton/Btu	0.95	kW/ton	X	800 F	LH =	85 k	Wh/yr
Total Recommend	ed Cooling Electr	ical Cons	umption:					=	107 k	Wh/yr
Total Cooling ⊟ect	trical Consumptio	n Saving	s:					=	214 k	Wh/yr
Cooling - Electrica										
Existing Cooling E High School	4,374 Btu/hr ÷		ton/Rtu_v	1 10 K	V/ton x	80%	Demand	I Div -	0.32 kW/	mo
Bem / Middle	5,103 Btu/hr ÷				V/ton x		Demand		0.34 kW/	
Bem Gym	3,645 Btu/hr ÷				V/ton x		Demand		0.27 kW/	
Gym / Votech	6,683 Btu/hr ÷				V/ton x	80%	Demand	d Div. =	0.42 kW/	
Total Existing Coolin	g Electrical Deman	d:						=	0.32 kW/	mo
Recommended C										
High School	1,458 Btu/hr ÷				V/ton x		Demand		0.11 kW/	
⊟em / Middle ⊟em Gym	1,701 Btu/hr ÷ 1,215 Btu/hr ÷				V/ton x V/ton x		Demand Demand		0.11 kW/ 0.09 kW/	
Gym / Votech	1,337 Btu/hr ÷				V/ton x		Demand		0.09 kW/	
Total Recommended			ionibia	0.00 KI	WOII X	0070	Domain	=	0.11 kW/	
Total Cooling ⊟ectri								=	0.21 kW/	mo
Assumes 7 month	hs per year usage:									
Annual ⊟ectric D	emand Savings:							=	1 kW/	yr
F										
	leating Infiltration		^ -fld		CE DT 0	F	1.00 -	E 0E4	Btu/hr	
⊟em / Midd	ol 12 doors lle 14 doors		6 cfm/door 6 cfm/door		65 DT °		1.08 =		Btu/hr	
Bem Gym	10 doors		6 cfm/door		65 DT °		1.08 =			
Gym / Vote			cfm/door		65 DT °		1.08 =			
	ng Heat Infiltration		CHITAGOOI	^	55 51	. ^	=		Btu/hr	
Total EXIST	ng roat initiation	Loud.					_	3,034	Durin	
Recomme	ended Heating I	nfiltratio	n:							
High School			2 cfm/door	х	65 DT °	Fx	1.08 =	1,685	Btu/hr	
⊟em / Midd			2 cfm/door		65 DT °		1.08 =		Btu/hr	
Bem Gym	10 doors		2 cfm/door		65 DT °		1.08 =		Btu/hr	
Gym / Vote			2 cfm/door		65 DT °		1.08 =	1,544	Btu/hr	
	mmended Heat Inf						=		Btu/hr	
									D	

= 3,370 Btu/hr

Total Heat Infiltration Load Reduction:



# 2.8 Door Weatherstripping

#### Heating Savings:

meaning caring											
Existing Heating	⊟ectrical Consumption:										
High School	5,054 Btu/hr ÷ 72 °F x	45,568 hr- °F ÷ 8	0% Comb.eff. ÷ 91,500 Btu/GA	L = 44 Ga/yr							
⊟em / Middle	5,897 Btu/hr ÷ 72 °F x	45,568 hr- °F ÷ 8	0% Comb. <sub>eff.</sub> ÷ 91,500 Btu/GA	L = 51 Gal/yr							
⊟em Gym	4,212 Btu/hr ÷ 72 °F x	45,568 hr- °F ÷ 8	0% Comb. <sub>eff.</sub> ÷ 91,500 Btu/GA	L = 36 Gal/yr							
Gym / Votech	7,722 Btu/hr ÷ 72 °F x	45,568 hr- °F ÷ 8	0% Comb. <sub>eff.</sub> ÷ 91,500 Btu/GA	L = 67 Gal/yr							
Total Existing He	ating Electrical Consumption:			198 Gal/yr							
Recommended H	leating Electrical Consumption:										
High School	1,685 Btu/hr ÷ 72 °F x	45,568 hr- °F ÷ 8	0% Comb. <sub>eff.</sub> ÷ 91,500 Btu/GA	L = 15 Ga/yr							
⊟em / Middle	1,966 Btu/hr ÷ 73 °F x	45,568 hr- °F ÷ 8	0% Comb.eft. ÷ 91,500 Btu/GA	L = 17 Gallyr							
Gym / Votech	1,544 Btu/hr ÷ 74 °F x	45,568 hr- °F ÷ 8	0% Comb. <sub>eff.</sub> ÷ 91,500 Btu/GA	L = 13 Gal/yr							
Total Recommen	ded Heating Electrical Consum	ption:		44 Gal/yr							
Total Recommen	ded Heating Electrical Consum	ption:		44 Gal/yr							

# 2.9 Water Heater Setpoint

#### **Affected School Rooms**

Cafeteria

# **Existing Conditions**

The existing domestic water heater is set to 180°F. The dishwasher uses chemicals for sanitation and therefore does not need water that hot.

# **Upgrade Recommendation**

Lower the domestic water heater setpoint in the kitchen to 140°F.

# **Quality of Life Implications**

In addition to the energy savings, this will reduce the risk of scalding.



# 2.9 Water Heater Setpoint

Water Heating - Natu	ıral Gas Consumption
Existing Water Heating	Natural Gas Consumption:

Kitchen Water Heater	2,063 Btu/hr x	8,760 hrs	÷ 80% Comb.eff.	÷	91,500 Btu/GAL	=	247 Gal/yr
Total Existing Water Heating Natural Gas Consu	mption:					=	247 Gal/yr

Recommended Water Heating Natural Gas Consumption:

Kitchen Water Heater	1,299 Btu/nr	Х	8,760 nrs	÷ 80°	% Comb.eff.	÷	91,500 Btu/GAL	=	155 Gavyr
Total Recommended Water Heating Natural Gas C	Consumption Sa	ving	s:					=	155 Gal/yr
Total Water Heating Natural Gas Consumption:								=	91 Gallyr

# 2.10 Refrigerator and Freezer Consolidation

#### **Affected School Rooms**

Kitchen and Cafeteria

#### **Existing Conditions**

Currently there are three refrigerated milk cases and one standard refrigerator in the kitchen and cafeteria that are plugged in throughout the summer and other extended breaks.

# **Upgrade Recommendation**

Initiate a plan that the refrigerated cases and refrigerator shall be unplugged during summer and other extended breaks. During this time any remaining food will be consolidated into the walk-in refrigerator or freezer.

#### **Quality of Life Implications**

This is purely an energy saving measure.



# 2.10 Refrigerator and Freezer Consolidation

### Refrigerator and Freezer Consolidation Savings

Equipment	Qty.	Volts	Watts	kW	Corr. Factor	Adjusted kW	kWh/year	\$/year
Milk Case	3	115	276	0.828	0.250	0.207	298	\$36.79
Refrigerator	1	115	100	0.100	0.250	0.025	36	\$4.44

Total

Savings: 334 \$41.23

## 2.11 Unplug Laptop Charging Carts

#### **Affected School Rooms**

Classrooms

# **Existing Conditions**

Laptop charge carts are found in most classrooms and are plugged into electrical outlets at all times. The cart is continuously using power while plugged in even during long periods of the building being unoccupied, like over scheduled breaks in the school year.

#### **Upgrade Recommendation**

Ensure teachers unplug charging carts during extended breaks as an added measure to their existing shutdown checklist.

#### **Quality of Life Implications**

This is purely an energy saving measure.



# 2.11 Unplug Laptop Charging Carts

#### **Unplug Laptop Charging Carts**

	Equipment	Qty.	Volts	Watts	kW	Corr. Factor	Adjusted kW	kWh/year	\$/year
_	Laptop Charging Carts	13	115	60	0.780	1.000	0.780	1,123	\$138.62
_							Total		
							Savings:	1,123.2	\$138.62

#### 3. RFP Submission Guidelines

#### Please submit RFP Responses to:

H. W. Byers Attendance Center 4178 Highway 72 East Holly Springs, MS 38635

Attn: Billy Gray

(662) 252-4271

bgray@mcschools.us

# Your Response should include the following:

- (1) Appendix Intent to Bid and Company Overview
- (2) Your Detailed Bid(s)

# **Appendix**

Section	Торіс	Intent to Bid
2.1	Lighting Upgrades	
2.2	Lighting Controls	
2.3	Install Window Film	
2.4	Computer Plug Loads – Management Software	
2.5	Vending Machine Controls	
2.7	HVAC Controls – Labor Only	
2.8	Install Door Weatherstripping	

# **Company Overview**

(Provide below or on additional pages. Attach Bid(s) to this Appendix)